BROOKLYN BOTANIC GARDEN

PLANTS & GARDENS

BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

HERBS AND THEIR ORNAMENTAL USES

Planning the Herb Garden

Making a Knot Garden

Herb Gardens in Color

Growing Herbs in the City

Herbs in Containers

Public Herb Gardens

Lavender & Thyme

Old Roses

SPRING
1972

NEW SERIES
Vol. 28 No. 1

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(*Continued on third cover*)

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CONTENTS

Herb Garden with Beehive ..... *Marjorie J. Dietz* Cover
Among Our Contributors ..... Inside Front Cover
Doorway Herb Garden ..... *George Taloumis* 2
Letter from the Brooklyn Botanic Garden 3
A Garden of Herbs ..... *Hester Mettler Crawford* 4
The Beauty of Herbs ..... *Priscilla Sawyer Lord* 5
Planning the Herb Garden
Lucille Teeter Kissack with the collaboration of *Elsetta Gilchrist Barnes* 7
Herbs in the Ornamental Garden ..... *Allen Paterson* 10
The Vegetable Gardens at Mount Vernon ..... *Robert B. Fisher* 13
Herbs in the City Garden ..... *Frances Ellis Price* 16
A Balcony Herb Garden ..... *Emily E. Trueblood* 18
The Log House Garden—An Herb Garden for Children ..... *Frances Zverina* 20
A New Herb Garden in Chicago ..... *Edith Foster Farwell* and *Elizabeth Foster Brown* 22
Herbs in the California Landscape ..... *Elizabeth D. Rollins* 24
Ancient Herbs in a Modern Landscape ..... *Alta Dodds Niebuhr* 26
New Zealand Herb Gardens ..... *Clare M. Simpson* 29
Herbs in English Gardens ..... *Elizabeth McKenzie* 31
Observations on Herb Gardening from England ..... *Madge Hooper* 33
Do You Know the Medlar? ..... *Lewis F. Lipp* 34
A Community Herb Garden ..... *Katharine Treat Patch* 35
Herb Gardens and Plantings in Color 37
A Purple-leaved Basil ..... *Joseph M. Lent* 39
Boxwood—Classic Shrub for Herb Gardens ..... *George S. Avery* 40
Herbs in Dried Bouquets ..... *Mary E. Baer* 45
Herb Gardens in Color 47
Come into My Kitchen ..... *Josephine DeCiantis* 49
Herbs as Ornamentals for the Vegetable Garden ..... *Minnie Worthen Muenscher* 51
Roses of the Herbalists—A Legacy of Fragrance ..... *Graham Thomas, V.M.H.* 54
Knot Gardens ..... *Bernard Currid* 57
Herbs in Combination ..... *Charlotte Erichsen-Brown* 61
Artemisias are the Grayest Plants ..... *Helen M. Fox* 68
Herbs in the Rock Garden ..... *Dorcas Brigham* 70
Garden of Fragrance ..... *John E. Bryan* 73
Smell-and-touch Garden ..... *Nancy Shopis* 75
Lavender and Thyme ..... *Eleanor Brown Gambee* 76
A Kitchen Garden in Containers ..... *Mary Mason Campbell* 79
Summer on the Farm ..... *Elizabeth Remsen Van Brunt* 81
Herbs for a Winter Garden ..... *Helen Tilton Batchelder* 83
Books for Further Reading ..... *Hester Mettler Crawford* 84

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For a list of topics see back cover.

George Taloumis

Above: Strawberry barrel is feature of a doorway herb garden.

Left: Nasturtium plants and a santolina, clipped to a ball shape, are shown in another section of the same garden. The edging plant is teucrium.

LETTER FROM THE BROOKLYN BOTANIC GARDEN

Herb gardens in America date from the first colonists who brought seeds and cuttings of their most indispensable medicinal and culinary plants to the unknown New World. For many generations, herbs were grown for household utility and fragrance rather than primarily for beauty. There are few readers who do not recall some childhood memories associated with herbs: the lavender sachet in the linen closet, the orris root that scented bureau drawers, the potpourri on the living-room table, and the fresh mint in cooling drinks and in sauce for roast lamb.

The traditional uses of herbs continue as strongly as ever for hobbyists, but gardeners are beginning to appreciate them in greater degree for their decorative qualities as well. Some herbs are first-rate border plants in their own right. The great diversity of herbs offers ample choices for various situations. Some dwarf herbs are excellent edging plants, while tall ones like angelica can stand as focal points at the back of a border. Sweet woodruff, the essential ingredient in May Wine, makes a subtly patterned ground cover for shady places and is a welcome change from pachysandra.

The task of Guest Editor Hester Mettler Crawford and the thirty-three Contributors has been to examine the great world of herbs from the ornamental point of view and to tell us about some of the most outstanding. Let us take this opportunity to thank one and all of them who made possible this special-feature of PLANTS & GARDENS.

Among the plants that have the most appeal for visitors to the herb gardens at the Brooklyn Botanic Garden are the silver-gray santolinas and artemisias. Cutleaf tansy, at first glance similar to the laciest of Boston ferns, is another favorite. One of the less common herbs that continually draws attention is the purple cutleaf perilla. In the month of August, garlic chives, with their sturdy white flower heads, take their place among the best summer-flowering perennials. The spent flowers must be picked before seeds ripen unless you want this onion relative to spread through the garden.

Whatever your interest in herbs, let this be a cordial invitation to wander through the following pages, to find old favorites and new uses, and to put to work in your garden a few of the ideas that our Contributors have brought together to enhance your enjoyment of herbs.

Frederick McGourty, Jr.

Editor

The Greater New York Unit of the Herb Society of America has, by gift, made possible the color photographs that appear in this Handbook.

Gottscho-Schleisner

Clary sage towers above lower herbs.

Claude Johnston

Rosemary—a plant for all gardens.

A GARDEN OF HERBS

An herb garden created in the imagination and planted by the gardener's own hands brings some of the purest joys of life: beauty of color and form, bird song and hum of bees, the music of rain and wind, the pleasure of flavors and fragrances, and the delight in touching silken or velvety leaves.

Friends come to enrich our happiness, bringing love, inspiration and a sense of completion. Peace and contentment follow.

We hope this Handbook will bring some of the joy and peace which are at the heart of every garden.

Hester Mettler Crawford
Guest Editor

M. M. Graff

Sweet woodruff, with neat whorls of leaves, provides a ground cover in shade.

Herbs demand little of the earth and of the gardener's time, yet they yield much in visual pleasure

THE BEAUTY OF HERBS

Priscilla Sawyer Lord

IN ALL THE plant realm, there is no more beautiful blue than that of the borage flower with its dancing starlike blooms; similarly, the sunburst array of marigold and calendula flowers and the buttons of tansy are sheer delight to the eye. The satiny-textured mallows, the lacy valerian, the sheer brilliance of red and pink bergamot, the stateliness of mullein and hollyhock make vibrant splashes of color in midsummer gardens. The dramatic pompons of the various alliums are all too little known. Even the homely foxglove has been transformed in its color range to highlight the shaded flower border. These are but a few of the colorful herbs: others are less spectacular in flower, but are significant for fragrance or foliage pattern.

The Gift of Fragrance

There is a curious stimulation, actually a sense of delighted intoxication, evoked by working among sweet-scented plants. Many of the "improved" varieties of garden flowers have been hybridized to augment color, size and form, but with one appealing ingredient deleted, that of fragrance. For that element alone it is important to plant herbs among garden flowers for the pleasure that their fragrance affords.

Green provides the backdrop for all flowering plants, with the green of grass paths and the more varied greens of ground covers as stage. One of the most attractive of all fragrant ground covers for moist shade is the Corsican mint (*Mentha requienii*), a perennial herb that is not reliably winter hardy in the northern United States but which can be perpetuated by wintering a few plants in a coldframe or in pots placed in a cool but well lighted window. The emerald brilliance of the microscopic leaves makes a mat of pungent foliage with the tantalizing odor of crème de menthe.

Carpets for Sun and Shade

Terraces, paths, and other areas paved in flagstone or brick laid in sand become all the more appealing when interlaced with thyme. Thyme, a plant never forgotten when once trod upon, makes a green rug for a path or terrace or to cover a slight slope; it may be used to soften outcroppings of rocks, dry walls and ledges. The creeping mother-of-thyme (*Thymus serpyllum*), with its dark, shining, aromatic leaves, or the common thyme (*T. vulgaris*), with broader leaves, of dark green, play their part well in enriching the scene.

Sweet woodruff (*Asperula odorata*) is an ideal ground cover for shady places. It is a gem of a plant in every respect, with neat whorls of lanceolate leaves and sheets of minute white star-shaped blossoms in spring. Sweet woodruff is one of the herbs valued by flower arrangers who enjoy using distinctive foliage. A cutting or two of any herb in an arrangement is reputed to help keep the water fresh.

Low Hedges

There are many herbs that can be used to create a knot design or as a border. One of the choicest is germander (*Teucrium chamaedrys*), a plant with glossy dark green, toothed leaves on erect stems. As its leaves are small and stiff, germander can be clipped to form a neat small hedge. *Santolina chamaecyparissus*, often called lavender-cotton, is an edging plant with gray coral-like foliage. There are also two green santolinas encountered in American gardens: *S. virens* with dark green leaves, finely cut and close set, and

George Taloumis

Frilly lady's-mantle around a birdbath.

S. v. ericoides with emerald green threadlike foliage. The lemon yellow buttonlike blooms of both are borne in clusters in midsummer.

Double-duty Herbs

A border of curly parsley (*Petroselinum crispum*) gives double pleasure for its eye appeal and culinary value. Its bright green, tightly curled leaves make it an exceptionally decorative edging plant. Salad burnet (*Poterium sanguisorba,* syn. *Sanguisorba minor*) is especially attractive as an occasional plant in the border. It grows 18 inches tall and is partially evergreen, with delightful rosettes of tooth-edged pinnate leaves varying from blue-green to lime. The special beauty of its foliage is in the manner in which the nearly round leaflets seem to be gathered at the midrib, causing the leaves to fold in half and create a crisp appearance. Drops of dew are pinpointed on the leaflets and often remain until midday.

Another herb that retains its dew-studded appearance until high noon is lady's-mantle (*Alchemilla vulgaris*). Its ornamental value is in its pleated, fan-shaped leaves of characteristic chartreuse, although they can be a deeper green in some soils. It is displayed to perfection when planted in drifts along the border, either in partial shade or full sun, on a bank or in a rock garden. The corymbs, of small, airy flowers—also chartreuse—are long lasting and can be dried for winter bouquets.

The unusual structure of ambrosia (*Chenopodium botrys*), a hardy annual, makes it worth growing. The leaves resemble those of a miniature oak, while the flowers are lime-green plumes. Try planting two monochromatic annuals with ambrosia: the new zinnia 'Envy' and nicotiana 'Limelight.' The effect is subtle and delightfully cool.

Bedstraw (*Galium verum*) freely sends its perfume into the air and is attractive to bees. Dainty foliage creeps along the ground in spring; later, as the fragrant yellow blossoms develop, the plant grows taller. The small, slender leaves form whorls around the stems. Fennel (*Foeniculum vulgare*) is another ethereal plant. Its 4-to-5-foot stems are expanded at the base. The leaves are bright green, feathery and threadlike in appearance.

The tall-growing rue (*Ruta graveolens*) is an ornament for the back of the border. It is a musky-smelling plant with beautiful blue-green persistent foliage. Angelica (*Angelica archangelica*), with a height of 6 to 10 feet, is a background plant usually treated as a biennial. It bears spectacular dome-shaped umbels of greenish-white fragrant flowers.

The biennial clary sage (*Salvia sclarea*) should be planted in the flower garden for the sake of its 3-foot spikes of beautiful flowers in shades of pink, blue and opal.

For accents beside the doorway or near a stone wall, try tub or pot plantings of pineapple sage (*Salvia rutilans*). The herb for all gardens everywhere, though not winter hardy in the North, is the much-praised rosemary (*Rosmarinus officinalis*). Scented geraniums in wide variety have merit for their unusual textures which vary from pebbly leaves to the delectable velvety feel of peppermint geranium (*Pelargonium tomentosum*). The range of leaf designs is almost unbelievable, ranging from the tiny finger bowl types to skeleton-leaved forms and the nearly round-leaved varieties. ◆

Decide what purpose it is to serve before

PLANNING THE HERB GARDEN

Lucile Teeter Kissack
with the collaboration of
Elsetta Gilchrist Barnes

ARE YOU interested primarily in growing herbs for ornament? If so, the design should be formal and the herbs carefully selected for neatness of habit as well as for beauty of foliage and flower.

If you plan to grow herbs chiefly for drying and use in cooking, a less formal plan will be suitable for fast-spreading sorts and for those that tend to flop unless staked. If the site is moist or shaded, your herb garden can be laid out in naturalistic style as a wildflower garden. If you cannot quite make up your mind, you can choose a composite: beds of familiar garden annuals and perennials interplanted or bordered with some of the more restrained herbs.

Climate will have a bearing on the choice of plant material and therefore to a considerable extent the character of the garden. The majority of common culinary and medicinal herbs are native to sunny, dry Mediterranean countries and will not succeed in areas of extreme winter cold such as Colorado, nor in the sultry, humid atmosphere of Florida summers.

Formal Design

Most home herb gardens are small in scale and, to be a significant part of the landscape design, must be associated with a larger feature. Whenever plantings are closely related to a house—outside principal windows, as an extension of a terrace, in a sunny corner in the angle of walls, or flanking a kitchen door—a formal plan is indicated. A garden that is constantly on view from the living areas of the house must be carefully planned to be as attractive in winter as in the growing season. To add all-year interest, fruit trees espaliered on walls create a bold pattern and raise the design to eye level.

Formal designs demand sound structural details: permanent edgings and paths made of brick, stone or gravel. To impart a feeling of unity, paths in the herb garden should repeat the material used in adjoining walks or terraces. Grass paths are seldom successful in a formal garden as their margins tend to waver under continued edging. Billowing mats of creepers such as thyme and dwarf saponaria (*Saponaria ocymoides*, a relative of bouncing Bet, a taller plant familiar in colonies along the roadside and on railway banks), and the decumbent flower heads of various kinds of dianthus, veronica and dwarf campanula are delightful when they spill over stone edgings and paved paths. On grass walks, these spreading plants make mowing difficult and end by destroying the turf.

A substantial curbing of stone or brick has a second advantage. It permits the level of soil in the beds to be raised somewhat above the surrounding grade, thus eliminating the possibility of standing water and insuring the sharp drainage so imperative for most of the herbs of the Mediterranean countries.

It is advisable to use a single perennial to edge all the beds in a patterned garden. The unifying effect of repetition in the borders will help overcome the sometimes spotty appearance of a miscellaneous planting.

Enclosing the Garden

An herb garden gains a feeling of intimacy when surrounded by a wall or hedge. Such an enclosure also serves as a windbreak and may reduce winterkill. Boxwood with its musky odor is the traditional hedge for herb gardens. Where boxwood is not safely hardy, yews, Japanese hollies or evergreen barberries may be substituted. For deciduous hedges, northern bayberry, flowering currant, hawthorns or clipped hornbeam make agreeable changes from the banality of privet.

Walks

Even though herbs for the most part are small in scale, it must be remembered that the garden they furnish is designed for human enjoyment. When space permits, walks should be 4 feet wide—a width of 6 feet is even better—so that two people can walk abreast comfortably. Beds defined by the paths should be of generous size, from 6 to 8 feet in width, with smaller features such as knot gardens fitted into the plan of the larger beds.

When an herb garden is far removed from a house or other architectural feature, it can be as naturalistic in design as the site suggests. The use of culinary herbs as edgings in a vegetable garden or along paths in an orchard is both ornamental and appropriate. Herbs can weave a fragrant ribbon before rows of old-fashioned roses, or border a path lined with herbal shrubs leading perhaps to a wildflower garden or woodland.

Herbs in a Wild Setting

Spicebush, high-bush blueberry, shadbush and chokeberry thrive in moist places and will endure some shade. Their autumn color is spectacular and their fruit attracts birds. The native witch-hazel, *Hamamelis virginiana,* is the last of the woody plants to bloom. It opens its straw yellow, spidery flowers in late autumn, usually after its brighter yellow leaves have fallen.

In the rich, damp soil at the foot of the shrubs, mints and bergamots will flourish, along with *Iris versicolor* and the towering dusty-mauve heads of Joe-pyeweed. If you are fortunate enough to own a stretch of brook, its banks can be planted with marsh-marigold and forget-me-not.

For dry, stony slopes, the background of herbal shrubs and trees may consist of bayberry and junipers, hawthorns, sassafras and black cherry, the last another prime attractor of birds.

The following list will serve as a guide in selecting herbs for edgings.

EDGING PLANTS FOR HERB GARDENS

Low Perennials

Asperula odorata—Sweet Woodruff
Dianthus plumarius—Cottage Pink
Fragaria 'Baron de Solemacher'—Strawberry
Teucrium chamaedrys—Germander
Thymus vulgaris—Common Thyme
Viola spp.

Low Annuals

Ocimum basilicum minimum—Dwarf Basil
O. b. 'Dark Opal'—Purple Basil
Petroselinum crispum—Curly Parsley

Medium-height (8-12 inches) Perennials

Allium schoenoprasum—Chives
Buxus sempervirens 'Suffruticosa'—Dwarf Boxwood
Hyssopus officinalis—Hyssop
Nepeta x faassenii—Catmint
Ruta graveolens 'Blue Beauty'—Rue
Salvia officinalis 'Purpurascens'—Purple Sage
Satureia montana—Winter Savory

Medium-height Annuals

Ocimum basilicum—Green Basil

Tall (12-18 inches) Perennials

Artemisia abrotanum—Southernwood
Artemisia stelleriana—Beach Wormwood, Dusty Miller
Lavandula officinalis 'Munstead Dwarf'—Dwarf Lavender
Ruta graveolens—Rue
Santolina chamaecyparissus and *S. virens*—Lavender-cotton

Tender Perennials

Beta vulgaris cicla cv.— Rhubarb Chard
Pelargonium crispum—Lemon Geranium
Rosmarinus officinalis—Rosemary
Tagetes tenuifolia pumila—Striped Mexican Marigold

George Taloumis

Paths in herb gardens are most practical when they are surfaced with brick, stone or gravel and contained by permanent edgings over which various kinds of low herbs can billow.

The ultimate value of herbs is as decorative subjects in the garden . . .

HERBS IN THE ORNAMENTAL GARDEN

Allen Paterson

HERBS reach their peak of usefulness when treated as ornamentals in their own right, not merely as subjects for the herb garden. With some this has always been the case: in England, lavender and rosemary have always been more important for their decorative effect than for production of oil and flavoring for roast lamb.

The grouping of these plants under "herbs" is merely a classificational convenience and thus artificially links many plants whose requirements are very different. Nevertheless there are numerous natural groupings, particularly among the low Mediterranean shrubs such as the lavenders, sages, santolinas and thymes.

Such plants as these, even in their basic culinary types, are useful in the ornamental garden, with their gray-felted leaves, their spikes of not inconsiderable flowers, and their aromatic scent, so apparent on hot summer days.

I am very fond of the sages, particularly *Salvia officinalis* 'Purpurascens.' Apart from its glowing wine-dark leaves with their hint of hidden green, it is also the best of the genus for flower. Long

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Adapted from *Country Life*, May 20, 1971.

This garden of mixed perennials features a number of herbs, especially in the foreground. Included are thyme, artemisia, sage, lavender, catmint, rue and bee-balm.

Marjorie J. Dietz

open spikes of pale purple hooded flowers continue for weeks in summer. The foliage of the variegated sage, a hump of cream and pale (rather than sage) green, is equally attractive. I have not had it flower. Both of these sages make plants 2 feet across in a season from cuttings rooted the previous year. *S. o.* 'Tricolor,' as its name suggests, can be most ornamental in leaf but does not do nearly so well as the others. The sages are marvelous plants for wide edgings, low hedges, or ground covers. All associate especially well with paving.

Five to seven plants of common thyme (*Thymus vulgaris*) make a tight patch which flowers well in a hot situation. Bees love it. The flowers of its variegated forms are less showy but the plants are so decorative at all seasons that this is of little account. Lemon thyme has a lovely little golden cultivar which should be in all gardens. It stands about 3 inches tall. These plants must be frequently renewed if they are to remain vigorous.

Some other worthwhile herbs come both from the category of Mediterranean sun-lovers and from the mint family (Labiatae). These include catmint, common but always fine tumbling over a stone wall. Golden-leaved marjoram is a little bigger than golden thyme and easier to keep. Hyssop, another low shrublet, exists in three flower color forms: white, pink and lavender-blue. It is better perhaps to keep this as an ornamental herb than to obey the Biblical "Purge me with hyssop and I shall be clean"—however true that is.

Lavender and rosemary are never so common that they should be neglected. The former comes in various flower colors: pale and dark lavender, white and pink. It is easy to propagate both by seed and by cuttings. Rosemary is less hardy but usually persists in mild climates if given perfect drainage.

The true mints continue the family relationship but of course prefer moister conditions and will accept shade. Although its visual impact is modest, I cannot refrain from mentioning *Mentha requienii* from Corsica. It looks like a weak form of Helxine (sometimes called "mind-your-own-business") except that it becomes studded in summer with minute purple flowers. Heavily mint-scented, it will survive happily in paving cracks on a sheltered terrace where it can be conveniently trodden on to release its fragrance.

Artemisia and santolina are two other genera of gray-leaved herbs. The former includes tarragon, a visually dull plant, but also old man (*Artemisia abrotanum*) with very finely divided leaves on a small bush, and the cultivar to be found among the easy species *A. absinthium,* 'Lambrook Silver.' The santolinas are used in the same way as the sages and fortunately are just as easy to propagate.

Among the border shrublets, mention

must be made of rue, the "Herb of Grace," with delicate blue-green foliage topped with heads of yellow flowers followed by interesting seed capsules. It sows itself around when suited. *Ruta graveolens* 'Jackman's Blue' is even more outstanding: its tight hummock of glaucous foliage is bluer than any other plant I can think of.

For ornamental effect, some of the umbelliferous herbs are hard to beat. Fennel is marvelous both in the common green form and in the purple one. Leaves are so finely divided that they appear to be a haze around the 6-foot stems. They are apt to seed themselves with gay abandon. Angelica, beloved of confectioners and one of the flavoring agents in gin, is a much sturdier plant. It has heavier cow-parsley leaves topped with near-spheres of delicate lime-green flower heads which are splendid for cutting. This is a most dramatic plant when well sited. It behaves as a biennial but young seedlings are usually around to keep the planting continuous. I also like sweet Cicely which Gertrude Jekyll commends heartily.

Other common herbs offer garden value. Free-flowering forms of chives can be used as an edging: they look much like thrift. Borage, while waiting to provide leaves for the summer evening fruit cup, is one of the bluest flowers and a very rapid height-giver for new gardens. An old English potherb, marigold (Calendula), still best in its typical shape and coloring rather than bred to resemble a zinnia or chrysanthemum, is one of the earliest summer flowers for cutting when grown from seed sown in autumn. It will flower just as the foliage of some of the other herbs is ready to accompany it. ◆

George Taloumis

This variegated sage has pale green leaves which are streaked with cream. The compact, rounded form of the santolina *(right)* is maintained by trimming in spring.

Mount Vernon Ladies' Association

Kitchen Garden at Mount Vernon, George Washington's plantation, as it looks today.

Portrait of George Washington as a gardener . . .

THE VEGETABLE GARDENS AT MOUNT VERNON

Robert B. Fisher

GEORGE WASHINGTON came into possession of the Mount Vernon plantation in 1754 while serving as Commander of the Virginia Regiment. He continued in military service until 1758 with infrequent visits to Mount Vernon until his retirement.

In January, 1759, he married Martha Dandridge Custis, the widow of Daniel Parke Custis, son of John Custis, a prominent early eighteenth-century Virginia planter with an interest in gardening. From his factor in England who supplied many articles for use on the plantation, Washington ordered on May 1 a book on gardening which arrived the following August. In September of that same year, he received from England on his order "one and a half dozen bell glasses for the Garden." These were the first indications of General Washington's interest in horticulture.

Washington had other books on gardens which he acquired through the years, including the contemporary edition of Philip Miller's *The Gardener's Dictionary* and Thomas Mawe's *The Universal Gardener*. It was from these books and from his observations on country homes of the period that he began to develop ideas for landscaping the grounds surrounding the family mansion.

The Kitchen Garden

The first development of this expanded landscape, the lower garden to the south of what was to be the West Lawn, was laid out as a kitchen fruit garden in the spring of 1760. The area was on a lower level with a terraced slope or "fall" running the full length of the garden. The initial plot of more than half an acre was rectangular in outline with walls of brick —molded and fired nearby. Paths of brick and of turf divided the vegetable beds into geometric patterns. The use of herbs to edge vegetable beds, a then-common practice, is not specifically mentioned.

Espalier Fruit Trees

Many of the walks, particularly those around the boundary walls, were bordered with espalier hedges of fruit trees. Growing against the higher walls were such fruit trees as peaches, nectarines and apricots.

During the nineteenth century, when the succeeding owners of Mount Vernon used this garden for subsistence, it was closed to the visiting public. In 1936, the Gardens Committee of the Mount Vernon Ladies Association was authorized to reproduce a typical kitchen garden of the period for presentation to the public.

The fruits and vegetables grown in the garden today are taken from a list of materials available to the gardeners of General Washington's period. These plant materials were further selected for compatibility with modern requirements for durability, attractive foliage and minimum maintenance.

Boxwood Parterres

Upon completion of the greenhouse in 1789, a gardener from Germany, accompanied by his wife, was engaged to manage it. It was at this time that Washington and his family left to go to New York and Philadelphia for eight years of service to the nation as president. The German gardener and his staff continued to propagate, among other materials, the dwarf English boxwood which had been first acquired from one of Washington's wartime commanders, Colonel Henry Lee, during the spring of 1785. The boxwood was planted in parterres on either side of the greenhouse. A young British engineer-architect, Benjamin Latrobe, in a journal of his visit in 1796, noted the two parterres in this garden, describing them as "neatly clipped and finished fleur-de-lis."

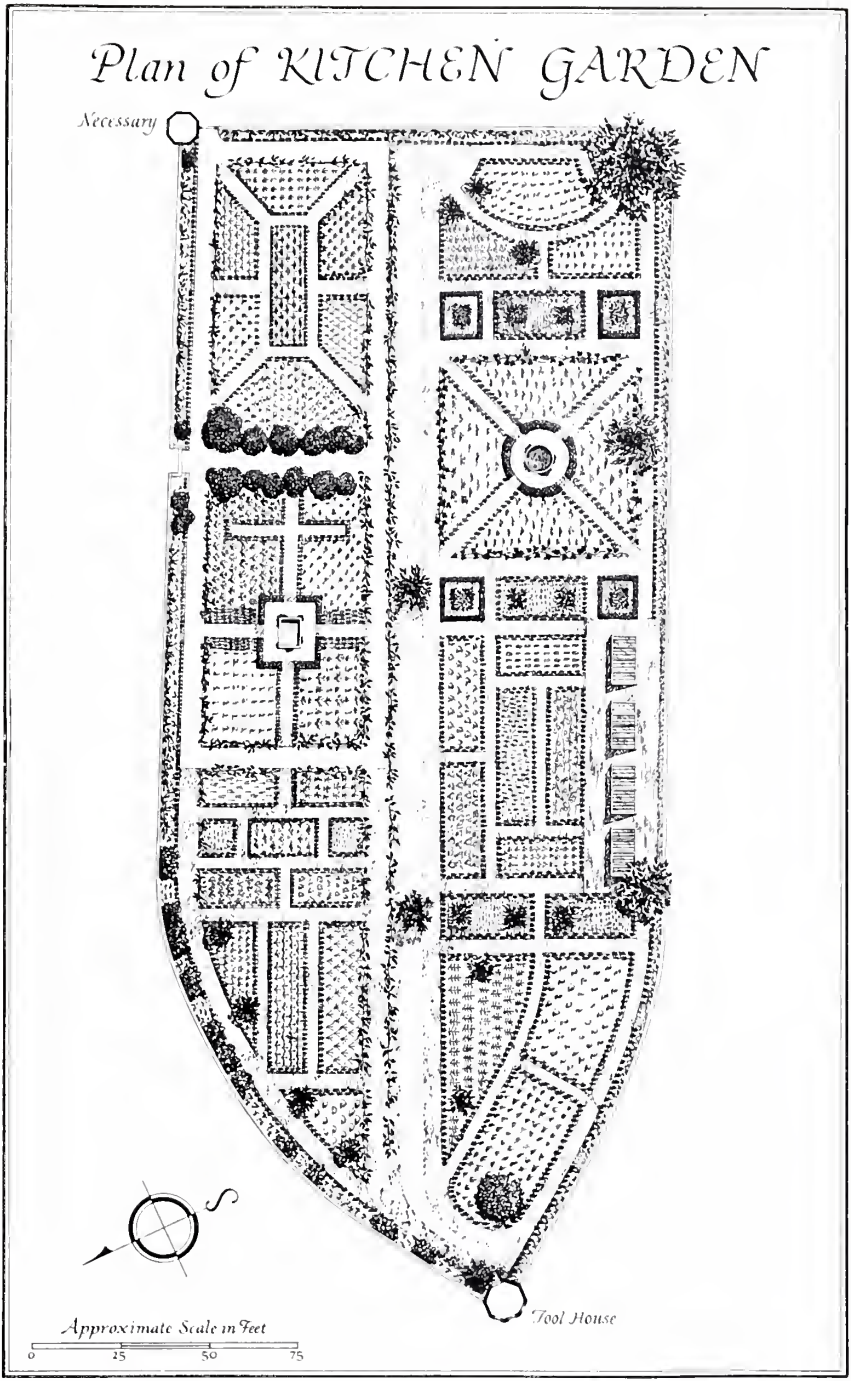
The propagation of boxwood was continued and in 1798 enough boxwood was available to replace the espalier hedges of fruit trees along the principal paths in this upper garden.

This garden is virtually intact from the eighteenth-century period with the exception of the boxwood edgings which have grown into large hedges 5 feet high and 5 feet wide. The parterres have been replaced three times during the intervening years in order to maintain the proper size of the plantings.

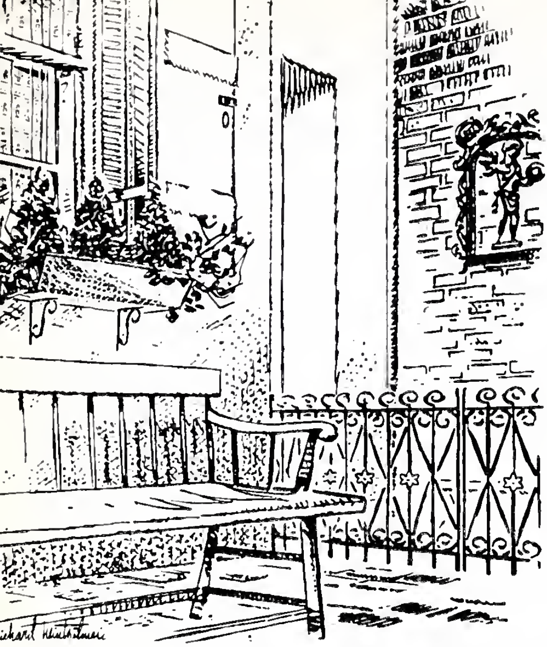
Another garden, the Botanical or Little Garden, was first planted east of the flower garden in 1785 with a collection of seeds received from China by Dr. James Craik and given by him to Washington. This garden was then maintained as a propagating and trial garden through the years for the seeds and plants that were sent to Mount Vernon from all over the world, most of them unsolicited. The location, close to the enclosing walls and buildings, was appropriate for the convenience of General Washington and for success of plant material.

The General's Nursery

Another area of about three acres maintained by the garden staff was the Vineyard-Nursery below the stable. Here, after several unsuccessful attempts to develop a vineyard, ornamental plant material was grown from seeds and rooted cuttings through the years 1785 to 1799. The plant material not needed on the plantation was sold to neighbors. Fruit trees and, later, hedge or "live fence" materials were grown in considerable quantity in "squares" which were also used for vegetables. The hedge material included the native red-cedar, the honey-locust and the English hawthorn. ◆



Mount Vernon Ladies' Association



Growing herbs in the city is a challenge, but the pleasures of scent, touch, taste and sight reward the effort . . .

HERBS IN THE CITY GARDEN

Frances Ellis Price

IT could have been the ailanthus tree in the backyard that made us buy the tiny house on a narrow street in central Philadelphia. We soon learned, however, that while "A Tree Grows in Brooklyn," it is not suited to a 12-by-15-foot yard where you want a garden to grow. Taking down a 40-foot tree and hauling it away through a 2-foot alley between the houses was a major operation. High board fences separating the properties had recently been removed so there was good air circulation, with sunlight about three hours a day.

To enclose our garden, we built an 18-inch wall of old bricks, making it one brick wide and incorporating an attractive iron gate leading to the alley between the houses. Pockets were left in the top of the wall to hold soil for future planting. Old bricks paved the yard and edged an area for a garden, set out 4 feet from the wall in the center and tapering to the sides in pleasing curves.

Topsoil, manure and peat moss were brought from the country in bushel baskets and deeply dug into the poor soil with added lime and fertilizer. A magnolia (*M. soulangiana*) was planted in each of the far corners and a holly (*Ilex aquifolium*) was placed in the center close to the wall.

Six plants of gray santolina (*S. chamaecyparissus*) were put in the pockets on top of the back wall while yellow pansies brightened the side walls. Two plants of lavender and two of rosemary, planted near the holly, carried out the gray theme of the santolina. Sage, lemon-verbena and tarragon created interest on the right. Sweet woodruff flourished under the magnolias. Groups of thyme and mints were planted on the left.

Annuals included sweet basil, marjoram, chervil and summer savory. Of course, chives and parsley were always added. Sweet violets made a charming ground cover for the whole garden. A windowbox under the kitchen window was filled with red geraniums, and a white-painted colonial bench invited our neighbors to visit.

During our absence in the summer, the safekeeping of the garden was left in the hands of our neighbors who watered, weeded and enjoyed the garden and its produce. We were told of fancy dishes they concocted with the herbs, of flower arrangements using lemon-verbena and lavender, and of beverages flavored with fresh mint leaves. May Bowl was a treat for all when sweet woodruff was in bloom.

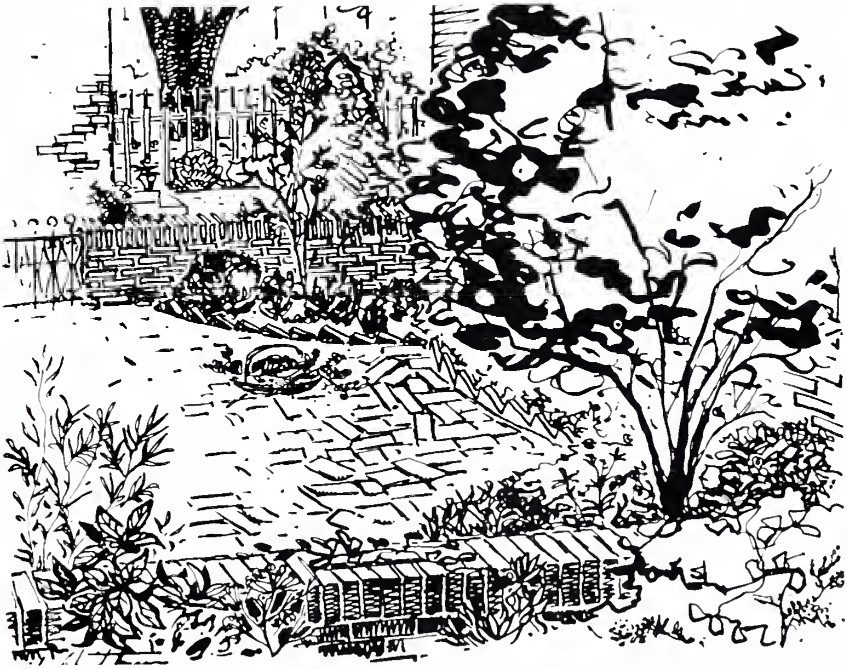
Several times the garden was opened to the public under the auspices of The Society of Little Gardens. Great interest was shown in the variety of unusual plants in their quaint old setting. Seventeen hundred enthusiastic people filed through the garden in one year, reading labels and asking questions.

It must be remembered that no matter how well you care for a garden in the city, soil fertility must be renewed each year and many plants replaced. For instance, lavender will sometimes survive outdoors but rosemary, lemon-verbena and geraniums must be brought in for the winter or purchased in spring.

The emphasis was sometimes changed from culinary to fragrant plants in the replanting program. Chives, parsley, marjoram and basil were put in the windowbox for table use. The garden was accented with heliotrope, mignonette, lavender and pinks and was completed with groups of geraniums: rose (*Pelargonium graveolens*), peppermint (*P. tomentosum*), apple (*P. odoratissimum*) and 'Prince Rupert' (*P. crispum*). The possibilities of experiment are limitless and one can create pictures of beauty and joy to be shared with others.

Whenever possible, an herb garden should be enclosed. By shutting out the city, a frame of walls, trees and shrubs creates an atmosphere of intimacy and response and, in addition, confines volatile fragrances and keeps them from drifting out of the garden.

When your background planting is complete, you are free to create a design that suits your surroundings, taking into consideration symmetry, scale, a focal point and accents. Herbs such as germander, the santolinas and parsley can all be used as borders as they will stand shearing. Plants within the garden beds should be in groups of not less than three and should be placed with consideration for growth, texture and color. ◆



Drawings by Richard Heintzelman

Kitchen garden in the sky . . .

A BALCONY HERB GARDEN

Emily E. Trueblood

THE CITY-DWELLER with a sunny balcony can enjoy all the satisfactions of an herb garden. Recently we had the pleasure of visiting such a balcony garden where herbs are successfully grown in summer, not only for their fragrance and beauty but also to furnish a ready supply for culinary creations.

One of the unique features of this garden is a group of four fig trees (*Ficus carica*) arranged as a screen across one end of the balcony. The fresh fruit, of course, is a delight on the breakfast table for several months of the year. The trees are grown in redwood containers, mounted on rotary platforms so that they may be readily turned to receive direct sunlight on all sides. The balcony is about 90 feet above the ground with an eastern exposure, which gives full morning sun but shelter from the intense heat of Washington's sultry summer.

Care of Figs

Figs can be grown from cuttings or layered branches in almost any type of well drained garden soil to which has been added a little commercial fertilizer. They can be trained or espaliered to suit the available space. They also have the added advantage of being almost free from disease and insect pests. For winter protection, the stems of the trees are closely wrapped. Several thicknesses of newspaper serve as a tent then the whole bundle is covered with a plastic bag, and the trees rolled back to a protected position against the wall. With this care the fig trees have survived winter weather which, in the Middle Atlantic states, may remain below freezing for a week or more at a time.

In addition to the figs the aromatic fragrance of herbs in the sun comes from long green metal window boxes attached to the railing of the balcony. These containers are lined with foil to prevent leakage of excess water on to the floor or the balcony below (a thoughtful necessity for apartment dwellers). The herbs are all grown in red clay pots which stay moist and cool and prevent the tender roots from drying quickly.

Variety of Herbs

Eighteen different species of herbs have been chosen, either for their fragrance, for seasoning, or for the beauty of the foliage which, in the brilliant sunshine, casts shadowy tracings on the floor. Those chosen because of their pungent fragrance include rosemary, sweet basil, lemon-verbena and lemon balm; English, creeping and lemon thymes; and pineapple, orange and apple mints. Among the herbs for seasoning are chives, green oregano, marjoram, sweet basil, tarragon, sage, various thymes and parsley. No lover of good cooking should omit them from a balcony herb garden. It takes only a few of these to flavor a summer salad or a party "dip."

For color as well as fragrance, two boxes of red and white petunias have been attached to the railing. Several celadon containers are also in use. One contains a trailing pink-flowered geranium with thick, waxy, ivy-shaped leaves which cascade down the side of a celadon tabouret. In another unusual pale green jar at the south end of the balcony is a small Japanese maple in the early stages of bonsai training. Near the door to the living room a white porcelain elephant supports on his back a pot containing a dwarf orange tree whose waxy white flowers add their delicate fragrance to those of the herbs. ◆

Adapted with permission from *The Potomac Herb Journal*, Vol. 7, No. 3.

The white porcelain elephant carries a potted dwarf citrus whose waxy white flowers fill the air with fragrance. Beyond it are tubbed fig trees which are carefully protected over winter to withstand the often below-freezing weather of Washington.

Emily E. Trueblood

Various herbs are grown in green metal window boxes attached to the railing of the balcony. Red and white varieties of petunias, to supply additional fragrance and color, are also a part of this balcony garden of Mr. and Mrs. Sam Broadbent.

THE LOG HOUSE GARDEN

Visual Education Services, Cleveland Public Schools

The Log House Herb Garden is a part of the Miles School Garden Center of the Cleveland Public School System. All the gardening activities are carried out by the children. Older students helped earlier in laying out paths, constructing fences and walls and preparing soil.

An Herb Garden for Children

Frances Zverina

FOR sixty-seven years the Cleveland Public School System has been carrying on an outstanding children's garden program. Its Horticulture Division now includes fifteen school garden tracts which are divided into individual plots for each child to cultivate under instruction of a garden teacher. The Miles School Garden Center is an example of one of the larger tract gardens. About three-hundred and fifty children, third grade through high school, have plots here. The Log House Herb Garden is an addition to the tract.

The Log House was the Zverina family playhouse. My father built it around 1908 for the five children in our family. In 1963, when the Zverina family presented the property to the Cleveland Public Schools, the Horticulture Division decided to make an herb garden around the log house.

At the start, the more advanced gardeners, junior and high school boys, performed all the manual labor necessary before planting could begin. They dug into the hard clay to lay drainage tile and poured concrete curbing to define the meandering paths. They also made the red brick walls leading to a sundial in the center of the hexagonal thyme garden. In addition, a number of rare trees and shrubs were planted. All regular gardening activities are carried out by the children themselves.

The younger children come in groups to become acquainted with herbs and to learn how to identify them. A lifetime interest in plants often begins here. The children love to pump water from the well and to look for frogs in the lily pool. One time when we were showing camomile to the little children, a kindergartner piped up, "That's what Peter Rabbit's mother gave him after he ran home from Mr. McGregor's garden." When the fourth graders saw rampion and read its German name, rapunzel, on the label, some of them chanted delightedly, "Rapunzel, Rapunzel, let down your golden hair."

Once a contest was held to find out which herbs are the children's favorites. Chives won, with lamb's-ears a close second. Girls especially favor dolls'-eyes or baneberry. Everyone likes to feel the downy leaves of marshmallow. The giant size of horse-radish leaves and the great height of lovage intrigue them. Children are fascinated to learn that a boat could be made from papyrus growing in the pool.

Adult visitors enjoy rambling about the garden or viewing the scene from old school benches under the trees. They find pleasure in coming upon familiar herbs and take great interest in the unusual ones. Among the medicinal plants are wild senna, Russian comfrey, goldenseal, butterfly weed, *Aloe vera, Vinca rosea* and herb Robert. Sweet flag, with its long aromatic leaves, is the herb that "is good for what ails you," and if nothing ails you, it is good for you anyway. Confectioner's herbs such as licorice, marshmallow, horehound and peppermint grow here, together with beverage-flavoring herbs: mugwort, wormwood, angelica and caraway.

Red raspberries grow in one fence corner, blueberries in another, and there are elderberries, too—elderberries to keep the witches away and for the fairies to dance under. Soapwort is appropriately planted near the stream. Pots of scented geraniums line the low brick wall.

In early spring Czech violets scent the air and trailing-arbutus blooms almost unseen. Later, white sweet woodruff and blue periwinkle carpet the ground under the maple tree. Pasqueflower comes in April followed by Florentine iris.

The Log House Herb Garden is so well hidden among trees that it preserves a country atmosphere—despite its location in a heavily populated city. ◆

The herb garden at the new Botanic Garden of the Chicago Horticultural Society in Glencoe, Illinois . . .

A NEW HERB GARDEN IN CHICAGO

Edith Foster Farwell and
Elizabeth Foster Brown

THIS small garden is divided into three sections, each of which could be a complete garden in itself. The entrance to the garden is flanked by two handsome trees, a white willow (*Salix alba*) and an ornamental pear (*Pyrus calleryana*). Beneath these are two different ground covers: white dead-nettle (*Lamium maculatum alba*) and peppermint (*Mentha piperita*).

The knot garden is the first of the three sections the visitor sees. The design of this was inspired years ago after the writers saw a picture of the knot gardens in the Brooklyn Botanic Garden. Here different plants intersect each other as in a bow knot. *Teucrium chamaedrys*, *Santolina virens* and *S. chamaecyparissus* are used to achieve the different shades of green. The entire bed is surrounded by a wattle fence only 4 inches high.

Behind the knot garden is a small stone statue, "Naughty Faun," created by Sylvia Shaw Judson. This statue is a beautiful focal point for the whole garden.

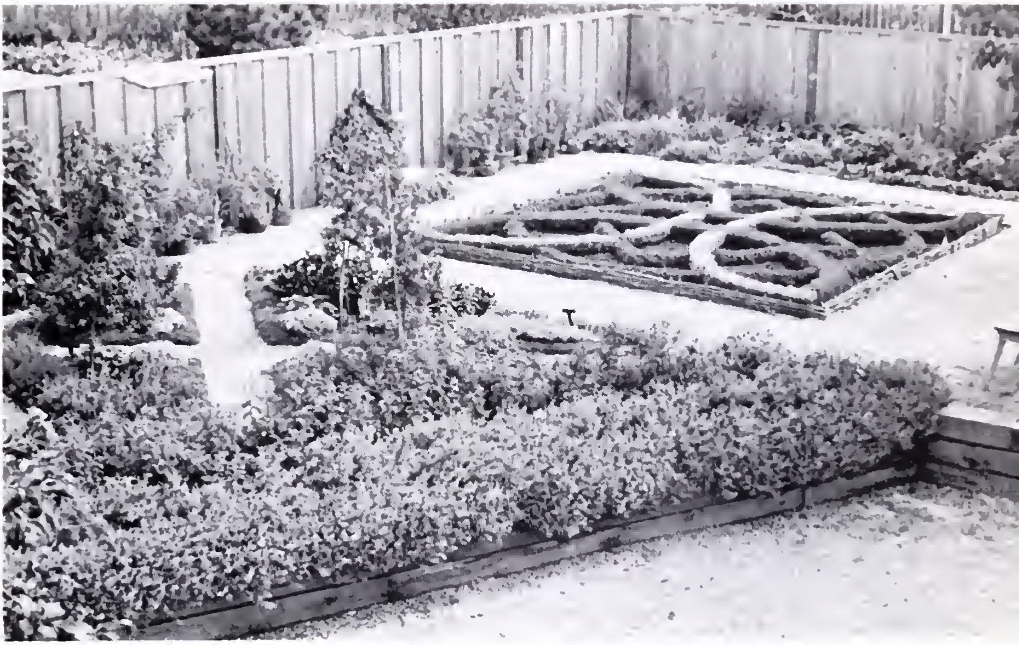
On the right of the entrance is a long narrow bed which is divided into four parts by a 9-inch-high wattle fence. These plots are planted with herbs for flavoring, for teas, and for medicine, and also plants mentioned in the Bible. The last creates much interest, for on the labels are verses such as "Purge me with hyssop and I shall be clean, wash me and I shall be whiter than snow."

On the left of the knot garden is the fragrance garden, designed by Ann Bruce Haldeman of Louisville, Kentucky. It is trapezoidal in outline, with diagonal paths that cut the plot into smaller beds for ready access and easy maintenance. These beds contain such fragrant herbs as lemon-verbena (*Aloysia triphylla*, better known to gardeners as *Lippia citriodora*), lavender (*Lavandula officinalis*), lemon thyme (*Thymus x citriodorus*), sweet marjoram (*Marjorana hortensis*) and many of the fragrant geraniums. Four heliotrope plants, each trained as a round-headed standard on a tall stem, serve as focal points of the triangular beds. Their height is set off by low-growing heliotrope and the lavender-flowered *Nepeta x faassenii* (*N. mussinii* of the trade) which tumbles over the outer boundary of the trapezoid garden. The pink rose 'Fairy' is beautiful at each corner of this border.

The great charm of this garden is its simplicity. It is intended to give ideas to any visitors who may plan to create their own herb gardens. It successfully points out the merits of herbs: their ease of maintenance, their singular beauty and unique role in history. Anyone who grows them will be richly rewarded. ◆

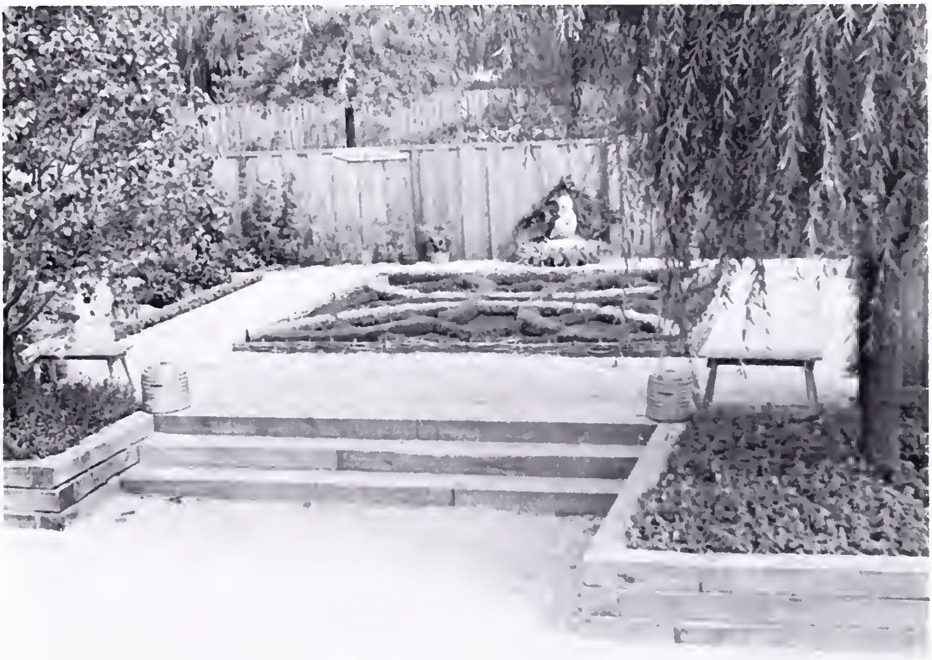
Frederick McGourty, Jr.

Detail of 4-inch-high wattle fence made from stems of shrubby dogwoods.



Chicago Horticultural Society

View and approach to knot garden of the Chicago Horticultural Society's Herb Garden, an example of a simple, effective use of herbs in an ornamental planting.



Drought resistance is a factor in judging the desirability of any plant used in landscaping . . .

HERBS IN THE CALIFORNIA LANDSCAPE

Elizabeth D. Rollins

MUCH of California has a typically Mediterranean climate with but two real seasons. The winters are wet but not too cold due to the moderating effect of the Pacific Ocean. The summers are dry with practically no rain from April to October, but fogs from the ocean keep the coastal areas cool.

Maintenance requirements over a long growing season have tended to eliminate the development of neatly tailored knot gardens and other formal plantings. Nor are perennial borders as popular as in areas where real winters give both plants and gardeners a rest. Cold-weather hardiness in this mild climate is not of prime importance, but drought resistance is a definite factor.

Mediterranean Herbs

Many important herbs are natives of the Mediterranean basin and these flourish in California as in their homeland. Horehound (*Marrubium vulgare*) has so generously sown itself over the countryside that many think it is a native weed. This is also true of fennel (*Foeniculum vulgare*) and black mustard (*Brassica nigra*), which were brought here by the Spanish padres two hundred years or more ago.

Many gardeners who grow herbs do not think of them as such. Catmint (*Nepeta x faassenii, syn. N. mussinii*) and the santolinas are used as edgings. Common lavender (*Lavandula officinalis*, known to many gardeners as *L. spica*) may be found as a low hedge. The Spanish jagged lavenders (*L. dentata* and the gray *L. dentata* var. *candicans*) seem to be always in flower and some of the other species (*L. stoechas, L. pedunculata, L. pubesens*, for example) bloom intermittently to give long-season color.

Rosemary

The prostrate rosemaries are widely used for wall draperies and as billowing ground covers. Single plants grow into interesting gnarled shrubs that give a bonsai effect, the blue blossoms attracting bees and small birds all winter long. In winter the landscape is also brightened by the metallic blue-gray foliage and chartreuse flowers of rue (*Ruta graveolens*).

Low-growing Herbs

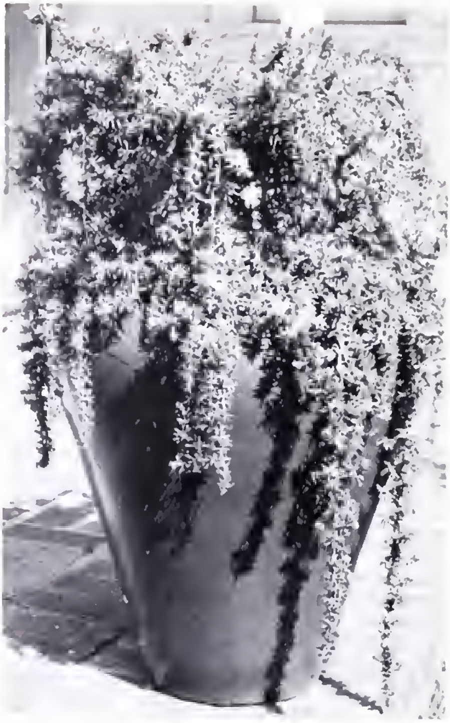
A number of herbs are mainstays of the California rock garden: the dwarf achilleas, artemisias, germanders, speedwells, lavenders and thymes are indispensable here. The many creeping varieties of thyme fill in between stepping stones and also cover plantings of dormant bulbs. The upright species make small evergreen shrubs and some, like *Thymus broussonetii*, are spectacular in bloom. Another choice subject for the rock garden is the ancient dittany of Crete (*Amaracus dictamnus*), which holds its decorative hoplike heads for months from summer through fall. Nestled against a rock, it is long lived in coastal California.

Sages

The sages also hold an important place in California, many being natives of the state. One of these, *Salvia clevelandii*, has a wonderful fragrance as well as attractive purple flowers. From neighboring Mexico comes the shrubby roseleaf sage (*S. involucrata*), which displays an abundance of beautiful deep pink bracts all during the fall, and *S. patens* with its

Gottscho-Schleisner

Horehound has escaped from cultivation in California and is found in abundance over much of the countryside.



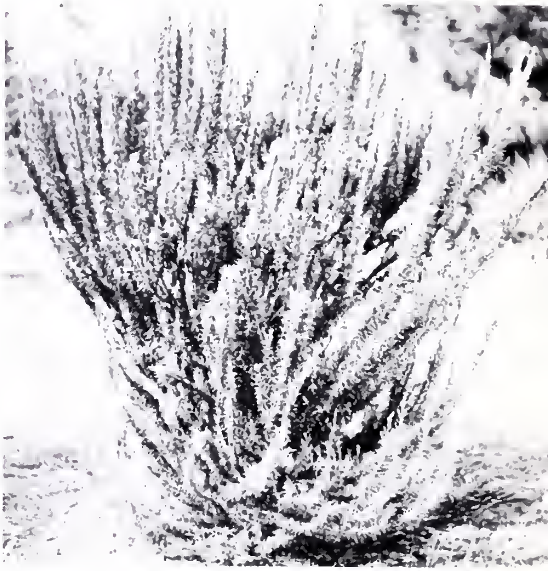
George Taloumis

Above: The prostrate or creeping form of rosemary and *(below)* the more typical shrub habit of common rosemary.

lovely clear blue flowers. The culinary sage (*S. officinalis*) in all its variations—purple, golden, tricolor, and the typical soft gray-green—gives foliage color the year round, while the deliciously scented pineapple sage (*S. rutilans*), with its bright red flowers, is one of several favorites planted to delight the senses.

Yerba Buena

One herb that should not be omitted is the little trailing native, Yerba Buena (*Micromeria douglasii*), which has a fragrance somewhat like the Old World costmary. It flourishes as a ground cover in shady places but does not tolerate moisture in summer. It is of interest that this herb gave its name to the early town of Yerba Buena—now know as San Francisco. ◆



A garden of Greek herbs in Texas

ANCIENT HERBS IN A MODERN LANDSCAPE

Alta Dodds Niebuhr

> *"The shores of the Mediterranean are really the source of most of the herbs we commonly use. They have reached us in many different ways, usually wandering across France and England, though a few came because American seamen liked some of the foods of Southern France and Northern Africa, and probably asked their wives why they didn't produce them!"—Mary Lines Wellman in* The Herbarist, *1964.*

SOME YEARS AGO, while living in Greece, I became intensely interested in the herbs native to that cradle of western civilization. When I moved to Texas, I was immediately impressed with the many similarities in climate and soil. In Texas as in Greece, summers are very hot and dry, winters are relatively mild, and the soil is generally alkaline. I welcomed the opportunity to grow Greek herbs and accordingly planned my new garden to feature them.

An account of the progress of my new garden may be of interest to those who live in a similar climate. Gardeners in more northerly areas must be warned that some Greek herbs, particularly the woody ones, will not stand severe cold and must be grown in pots or tubs which can be brought indoors for the winter. These include pomegranate, bay, storax, olive, and rosemary. Not all of the Greek herbs on my list are widely available in America, but the search for the rarer ones adds challenge to the project.

A description of the planting scheme which I am developing around my house will suggest ways in which Greek herbs can be used in a modern landscape. On either side of my front gate, I have placed a pomegranate (*Punica granatum*), a decorative scheme borrowed from King Solomon's temple. The front corners of the house are accented with a bay tree (*Laurus nobilis*), sacred to Apollo and used to crown heroes and poets in ancient Rome. Next to the bay trees are two myrtles (*Myrtus communis*), the herb associated with Aphrodite. A symbol of love and constancy, myrtle is still used in Europe and England in the bouquets and headdresses of brides.

Three plants of *Salvia officinalis,* a sage with lavender-blue flowers and gray foliage, stand close to the myrtle and contrast with its white flowers. Next is a large rosemary (*Rosmarinus officinalis*) with dark green leaves and tiny blue flowers. Three plants of gray-green oregano (*Origanum heracleoticum*) accompany the rosemary. At the end of the border, creeping thyme (*Thymus serpyllum*) spreads over the path by the front steps.

Yellow foxglove (*Digitalis grandiflora*) and blue delphinium (*D. staphisagria*) are set among the herbs for midsummer bloom. These can be interplanted with tulips, crocuses, sternbergias and anemones to extend the flowering season. Bulbs should be planted deeply so that they can withstand extremes of temperature and drought.

Returning to the front yard, I have put a shrubby storax (*Styrax officinalis*) in each corner. Known in Biblical times as "stacte," the dried extract of its inner bark was used as incense in churches.

See *Herbs of Greece,* 1970, by Alta Dodds Niebuhr. $5.00. Sponsored by the New England Unit of the Herb Society of America. Copies may be obtained from Mrs. Sargent H. Wellman, 103 Salem Road, Topsfield, Mass. 01983.

George Taloumis

The true myrtle is a shrub native to the Mediterranean countries.

Under one storax I planted Queen Anne's lace (*Daucus carota*) whose roots, according to Dioscorides, are sweet smelling and edible. Tulips in spring and the saffron crocus (*C. sativus*) in autumn add colorful variety to this grouping. Saffron, the dried stigmata of *C. sativus*, was esteemed by the ancients for its pungent odor and flavor and for its imagined medicinal properties. Its glowing red-orange color made it valuable as a dye and pigment for painting.

The storax in the opposite fence corner is underplanted with yarrow (*Achillea coarctata*, known to many botanists as *A. compacta*), whose flat heads of yellow flowers can be dried for winter bouquets. The blue flowers of chicory (*Cichorium intybus*) make a pleasing contrast. Chicory leaves are eaten raw or boiled; the roots, dried and roasted, are used to flavor or adulterate coffee. I have completed the grouping with white yarrow (*A. millefolium*) whose downy leaves were used by Dioscorides to stanch wounds.

In the back yard, in a moist spot by the birdbath, I grow lady's bedstraw (*Galium verum*) which Dioscorides recommended for treatment of burns. The roots of the plant yield a red dye and the crushed yellow flowers add color to butter and cheese. *Mentha viridis*, a pleasantly aromatic mint used in Greek cookery, and pennyroyal (*M. pulegium*) share the congenially damp spot.

(*Continued*)

Beds of herbs and herbal shrubs and trees line the fences at the sides and back of the garden. Low-growing chamomile (*Chamaemelum nobile, syn. Anthemis nobile*, sometimes called *Matricaria chamomilla* in the trade), with white daisylike flowers, is a charming plant to edge the border. Tea made from the dried flowers is used as a mild sedative, a remedy for colds and indigestion, and as a rinse for blonde hair. The taller pot marjoram is given a hot, dry place in the border.

Towards the middle of the border, the biennial woad (*Isatis tinctoria*), best known as a substitute for indigo in making blue dyes, combines well with rue (*Ruta graveolens*). Dioscorides wrote of rue that "being chewed, it ceaseth ye rank smells which come of garlic and onions," but considering the musty odor of rue, this may be a case of replacing one evil with another. The plant is in fact toxic to some people.

Spanish broom (*Spartium junceum*) grows at the back of the border where its loose spikes of yellow flowers brighten the scene in May and June. Lastly, a small olive tree (*Olea europea*) gives height where a tall accent is needed. Its dark green leaves, silvery on the reverse, make a lively picture when the wind turns them. The olive has been valued since ancient times for its fruit and for the oil expressed from it, but as an emblem of peace the olive makes its most eloquent claim for space in a modern garden. ◆

George Taloumis

A bay tree in Delphi, Greece. Bay trees in tubs are popular in warm-climate gardens.

George Taloumis

Rose geranium is one of the most beloved among the scented-leaved geraniums.

NEW ZEALAND HERB GARDENS

A combination of familiar plants from England and the native plants of the Maoris

Clare M. Simpson

THE ENGLISH HERB GARDEN came to New Zealand with the arrivals of missionaries and early settlers. Long before the arrival of British colonists, however, the Maoris had known and used native plants for medicine. The combination of native herbs with the familiar plants of English country gardens lends a unique character to New Zealand herb gardens and may account for their steady increase in popularity.

New Zealand's land area is smaller than that of the state of Colorado, yet its climate and soils vary to an extraordinary degree. Some sections are semi-tropical, others temperate. As soils may range from volcanic to heavy clay, no two gardeners are likely to have identical growing conditions.

My garden is on a windy hillside with heavy winter frosts. A belt of herbal trees and shrubs affords beauty, protection and privacy. The belt is composed of elderberry, bay, witch-hazel, datura, lemon eucalyptus, old-fashioned roses and varieties of salvia. The native Manuka (*Leptospermum scoparium*) and Kumarahou (*Pomaderris elliptica*), both prized by Maoris for their medicinal virtues, are included in the sheltering hedgerows.

Every part of the garden is utilized for herbal plants requiring special environments. A stream with wild watercress provides moist conditions for huge clumps of comfrey, acanthus, bergamot, angelica, loosestrife, lemon balm and varieties of mint. The lush growth of these moisture-loving plants creates a charming effect.

The formal herb garden, conveniently close to the back door, is designed for utility and attractiveness. Flowering chicory, elecampane, valerian, yarrow, borage, varieties of origanum, colorful thymes and sages mingle with the subdued gray aromatic foliage of wormwood and santolina.

Rosemary and southernwood grow on either side of the front gate. From it, a flagged path runs through the center of a herbaceous border to the house.

As I write, plants of many colors—mullein, foxglove, rampion, feverfew, wallflower, hyssop and calamint mingle happily with varieties of soft gray artemisia and lavender. A trellis covered with jasmine, honeysuckle, and sweet peas gives shade to plants of violet, primrose, cowslip and sweet woodruff. Border and Cheddar pinks and creeping thyme spill over the flagged path.

Several large containers and Grecian urns house my beloved collection of scented geraniums.

It is a simple garden, yet picturesque with color and fragrance which create the atmosphere of tranquility and peacefulness so necessary in our troubled world. No plant material is wasted but is instead dried for the crocks of potpourri that bring the perfume and color of the garden indoors for year-long enjoyment and refreshment. ◆

George Taloumis

Both dianthus and thyme thrive in the often narrow and seemingly inhospitable soil spaces between flagstones or other materials used to pave walks or terrace areas.

Herbs are given a prominence one seldom sees in Canada or the United States

HERBS IN ENGLISH GARDENS

Elizabeth McKenzie

HERBS in England are not restricted to herb gardens but are given tenancy wherever their gentle gray or dulcet green, enriching scents or satisfying form will provide an enhancement; too, they are grown just because they are loved.

Herbs are used as ground cover for roses both old and new. Pinks, fennel and dill, thymes and wallflowers, golden lemon balm (*Melissa officinalis variegata*), rue and little scented violas give a spicy dimension to beds of brilliant but scentless annuals. Tuffets of thrift, mossy mounds of artemisias, cushions of dianthus, and carpets of thyme serve to soften steps or embroider walls. Everywhere the pewter or silver, sage green or pale gold foliage of herbs mingles with the predominant green of familiar perennials.

All of this may sound as if herbs are mainly employed as garden tranquilizers. Not at all. One of the chief games of English gardeners is making garden pictures, an occupation that requires as much skill and passion as any other art. Here are a few of these memorable pictures: a regal company of angelica in the angle of yew hedges; a stretch of the exquisite masterwort (*Astrantia maxima*) in a magnolia's shade; that delightful comfrey known as Cherubim and Seraphim (*Symphytum grandiflorum*) colonizing a bank of shrubs; a corner bed of *Rosa centifolia* thickly planted with the extraordinary gray-blue beauty of 'Jackman's Blue' rue and edged with the irresistible leaves and cinnamon-scented sprays of lady's-mantle (*Alchemilla vulgaris*); sweet woodruff forming a hummocky border to a collection of philadelphus; the moonlit bells of Solomon's-seal curving under an old medlar tree; sweet Cicely spreading a lacy crinoline around the bole of a metasequoia; the great ivory-white plumes of snakeroot (*Cimicifuga racemosa*) counterpointing tall, dark cedars.

The late Victoria Sackville-West's garden at Sissinghurst Castle is a preeminent example of the multiple uses of the plants of our herb gardens. The ravishing garden of old roses with harmonizing perennials, and the sumptuous blue and purple garden are justly celebrated.

But I have a passion for white flowers and so it is the often copied White Garden that I love most of all. So quiet, so cool, so lovely a dream with all its cadences of silver, green, gray, white—a

George Taloumis

The swaying plumes of snakeroot are carried on stems often 6 to 8 feet tall.

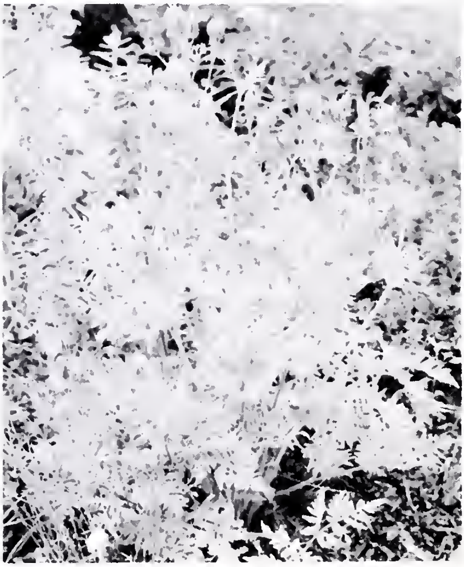
Adapted from *The Herbarist*, No. 37 (1971).

Paul Miles

The late Lady Sackville-West's herb garden at Sissinghurst Castle in England.

place for meditation after the excitements and exuberances of the other gardens. Box-edged enclosures hold much peaceful bounty: regal lilies, Culver's-root (*Veronicastrum virginicum*), platycodon, *Cistus ladaniferus, Senecio cineraria,* santolina, southernwood, silver and gray artemisia, bush and climbing roses, nigella, anemones, foxglove, the stately but free-seeding silver Arabian-thistle (*Onopordon arabicum*), clematis, *Stachys lanata,* philadelphus, various campanulas, and the noble spikes of colewort (*Crambe cordifolia*) with enormous clouds of bloom—again a tiny measure from this cornucopia of enchantment.

In my country, Canada, where every summer we must endure oppressive heat, a white garden could create an oasis of coolness, a blessed relief from glare, and a sanctuary for the wilting spirit. ◆



George Taloumis

Sweet Cicely has fernlike aromatic leaves.

Elizabeth McKenzie

This herb garden of formal and traditional patterns is enclosed by high brick walls.

Observations on Herb Gardening from England

AN English visitor to the herb gardens of the northern United States admires the luxuriant growth of basil, lemon-verbena, pineapple sage *(Salvia rutilans)* and other tender plants which in New England, as in the colder parts of the British Isles, must be taken indoors for the winter or treated as annuals. Less rigorous winters enable English gardeners, as well as those who garden in the milder climates of America, to enjoy the foliage of bay *(Laurus nobilis),* rosemary, purple-leaved sage (*Salvia officinalis* 'Purpurascens') and the golden-variegated sage (*S.* o. 'Icterina').

The labor involved in planning, planting and maintaining an herb garden may deter novice gardeners but many delightful gardens of herbs, like Topsy, have just "growed." Where time and care can be lavished, a formal herb garden has its charm. However, herbs are quite as much at home in modest and casual gardens, and may be just as ornamental there as in a larger framework. The informal jostling of plants, as in an English cottage garden, expresses the owner's personality and provides scents and savors, homely remedies and material for flower arrangements—a maximum of pleasure with a minimum of work.—*Madge Hooper*

Louis Buhle

DO YOU KNOW THE MEDLAR?

Rich in herbal lore and grown since ancient times

Lewis F. Lipp

THE MEDLAR (*Mespilus germanica*) is a distinctive small flowering tree or large shrub suitable for use as an accent in today's ornamental herb gardens.* Winter hardy as far north as Massachusetts and Ohio, the medlar has special appeal for horticulturists and historians.

The medlar, which is closely related to the pear and the hawthorne, has been known to reach 25 feet under cultivation. Fifteen-year-old trees at the Holden Arboretum in Mentor, Ohio, are 8 feet tall and 10 feet across. A native of Asia Minor, Iran and Greece, the medlar has become naturalized in parts of Europe and England. The tree is more common in English gardens than in America.

The full beauty, balance and grace—the hallmarks of the medlar—show to best advantage when it is planted as a specimen. It thrives in a sunny location in well-drained fertile soil.

The medlar produces numerous white-to-blush pink flowers in spring. Borne singly on short spurs, they are backed by a curious ruff of fully developed leaves. Unruly twisting branches and strange brown fruits, an inch or so wide, make the tree attractive throughout the year.

The fruit is harvested in late autumn but, as in the case of persimmons, is inedible until softened by frost or partial decay. In order to ripen the fruits after picking, turn them eye downward and space well apart on a shelf in a cool place. They make an excellent preserve or jelly.

Propagation by seed is relatively easy although it cannot be hurried. The decayed fruits, with the seed enclosed, are stratified in a moist medium for upwards of two years before germination takes place.

A number of forms have been selected over the years for their superior fruits, but only a few are available today. Among the best are 'Nottingham,' 'Royal' and 'Dutch Giant.' These English or European originations are grafted onto seedling medlar, pear, quince or hawthorn understock. Each cultivar varies in the size and flavor of its fruit. 'Dutch Giant' has incredibly lush growth while 'Royal' develops into a more restrained, somewhat shrubby tree particularly suitable for a small lawn. ◆

Editor's note: At this time it does not appear that the medlar is in the American mail-order trade. Sources abroad include J. C. Allgrove, Ltd., Langley Slough, Bucks, England, and Hillier & Sons, Winchester, England.

A herb garden to visit—for knowledge, for rest and for complete enjoyment . . .

A COMMUNITY HERB GARDEN IN CLEVELAND

Katharine Treat Patch

THE Western Reserve Herb Society, a unit of the Herb Society of America, designed and planted its first herb garden in 1942. Located on city property in the University Circle section of Cleveland, Ohio, this small garden was maintained by its members for 26 years.

When the Garden Center of Greater Cleveland was built on the same property as the original herb garden, it was necessary to create a new garden worthy of the magnificent structure. This was accomplished by redesigning, extending and rebuilding the existing plot. Its location, now the property of the Garden Center, is on Wade Oval, an extensive greensward surrounded by other beautiful cultural institutions.

The resulting formal Old World garden measures 160 by 90 feet. It was designed by landscape architect Elsetta Gilchrist Barnes, a member of the Western Reserve Unit, and was built by Herman Losely and Son. The garden was opened to the public on September 5, 1969.

Financial support for construction was obtained through projects of the Society, augmented by gifts from the Garden Center, members and friends of the Herb Society, garden clubs, and family and business foundations. Other important contributions included architectural and legal services, handsome old stone and wrought iron artifacts, and plant material given by members and by the City of Cleveland greenhouses. Without the generous support of these benefactors, an organization of less than a hundred members could never have undertaken so ambitious and specialized a garden. It was, in a true sense, a community project.

The auditorium window and the terrace that runs along its foot overlook the Wade Oval. In the immediate foreground is a knot garden, a feature of year-round attraction. Five old millstones, interlaced with ribbons of variously colored herbs, form the center of the design. The enclosing walls are built of enormous stones taken from the foundations of two ancient barns. Fragrant herbs are planted in beds along the base of the wall.

A tall armillary sundial in wrought iron, backed by a dense screen of pines, serves as focal point and terminus of the main axial walk. The pedestal of the sundial is a stone lawn roller once used by members of the Shaker religious community, with a large and a smaller millstone for the base.

Beyond the stone wall to the left of the knot garden are beds for dye plants, trial plantings, and for cutting. In the cutting garden, herbs are harvested for the Society's annual sale without making inroads on the display gardens.

To the right of the knot garden, on either side of the main crosswalk, are gardens for culinary and medicinal herbs. The secondary crosswalk leading past the armillary sphere to the dye and culinary gardens is backed by numerous historic roses in fragrant bloom from spring to fall.

Herbal trees and shrubs and climbing plants on wrought iron hoops add height and variety. The various sections of the garden contain over 3,500 plants representing more than 300 species and thus appeal to a wide range of interests.

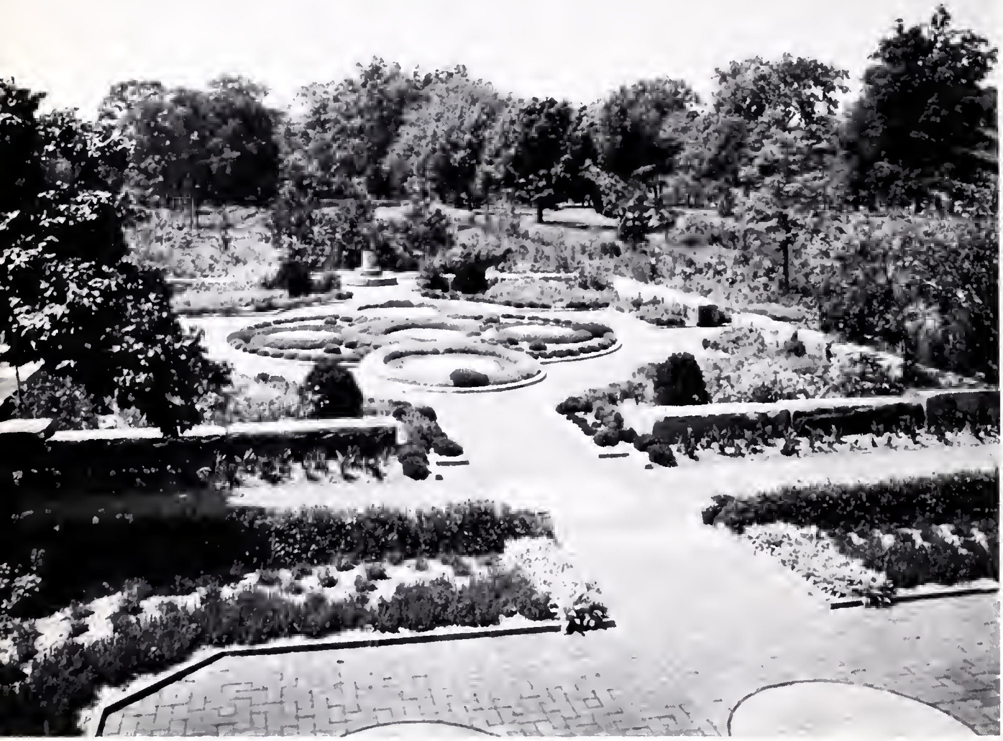
Maintenance

A notable feature of the Western Reserve Garden is that the Herb Society is entirely responsible for its regular upkeep. There are a general chairman and co-chairman, and under them, in turn, are a chairman and co-chairman for each section of the garden. With the assistance of many other members, they plan, plant, label, weed, dig, prune, fertilize and attend to herb record-keeping every Tuesday and Thursday during the growing season. One part-time salaried assistant does much of the heavy work and is available for special tasks.

Garden Projects

An Herb Garden Advisory Council is responsible for public relations, raising money for an endowment fund, and arranging for educational programs and publications. The Council has also translated lists of plants grown in the garden into seven languages, an important point in such an ethnically diverse city as Cleveland.

The garden is a volunteer project whose members learn and share their learning with others. The dedication reads: "The Western Reserve Herb Society has presented this herb garden to the people of Greater Cleveland for the enjoyment of all." Thousands of visitors from all parts of the United States as well as from foreign countries come to the herb garden every year. Artists and photographers, medical students, school children and members of garden clubs all find opportunity to pursue their particular interest. Many others come just for rest and refreshment, to enjoy the design, color and fragrance of this garden for "Use and Delight." ◆



Edward A. Taubert

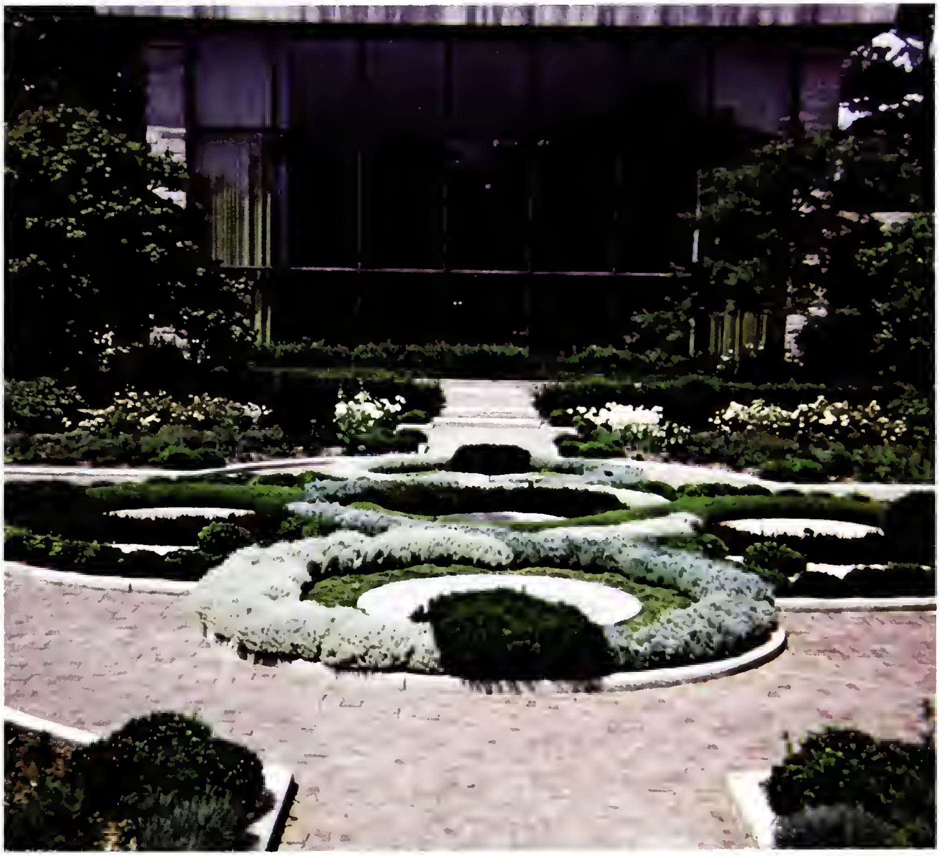
View of the Western Reserve Herb Garden from terrace and auditorium window of the Cleveland Garden Center. (See also opposite page.) The knot garden is of interest every month of the year.

Western Reserve Herb Garden

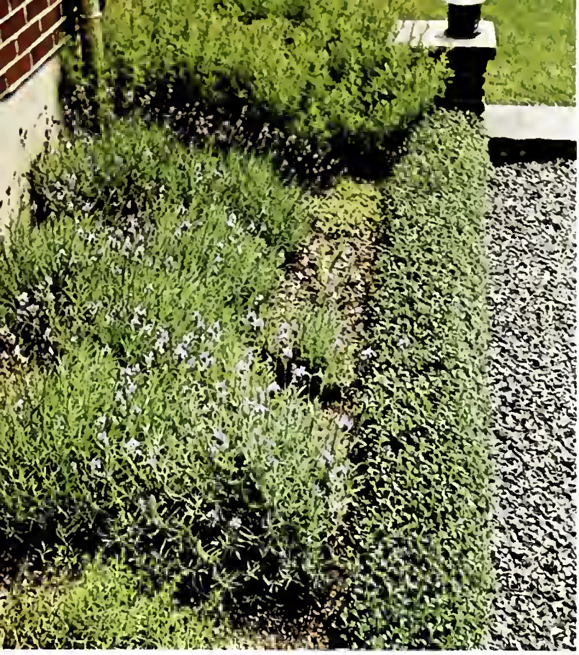
The Western Reserve Herb Garden, which is on the grounds of the Cleveland Garden Center of Greater Cleveland, Ohio, has been called one of America's outstanding public herb gardens. Members of the Western Reserve Chapter of the Herb Society of America maintain the garden. It is a garden of many parts and includes a central knot garden, dye plants, old roses, fragrant herbs, and medicinal plants.

Photographs by Irma Bartell

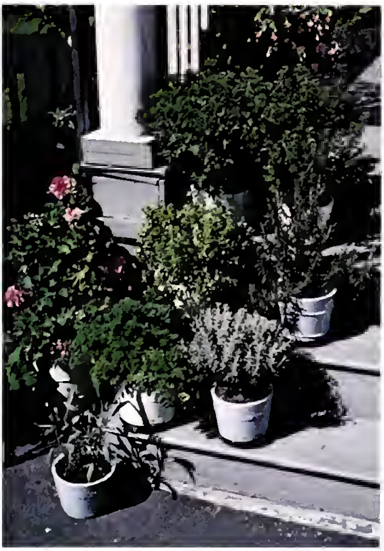
A detail of the garden—an allium clump against gray artemisia.



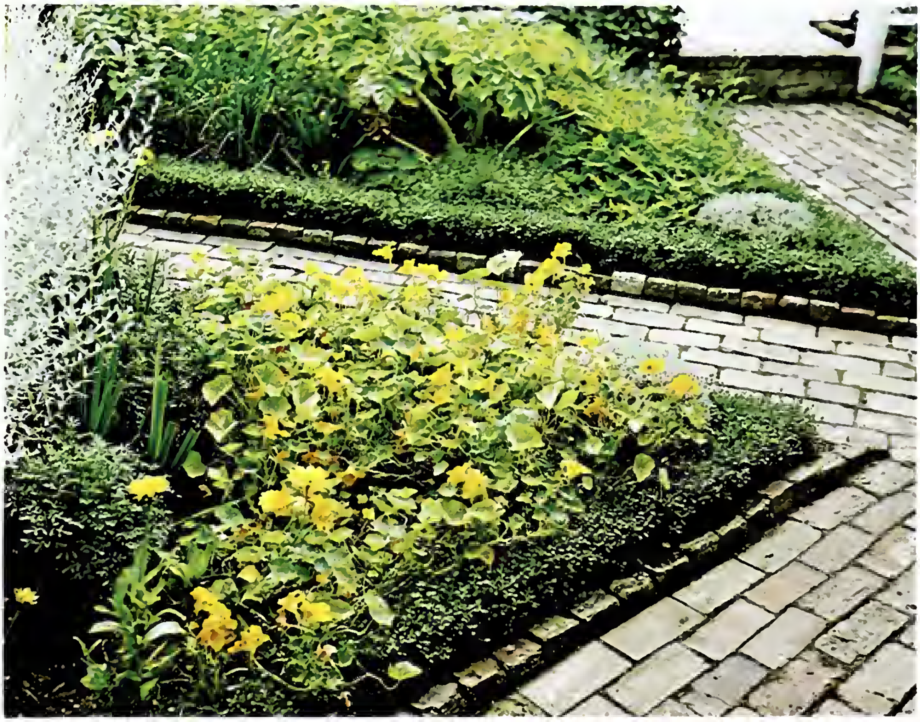
Above: A portion of the central knot garden of the Western Reserve Herb Garden.



Lavender *(Lavandula officinalis)* and a hedge of *Teucrium chamaedrys*.



Portable herb garden: herbs in tubs and pots decorate steps of porch.



Brick walks divide the sections of a formal garden where orange-flowered nasturtiums contrast with the gray and green foliage of other herb plants.

All photographs by George Taloumis

Handsome in foliage and flowers and valued for its flavoring property, too . . .

A PURPLE-LEAVED BASIL

Joseph M. Lent

THE ORNAMENTAL 'Dark Opal' basil, a form of *Ocimum basilicum,* is distinguished from the more commonly grown basils by the dark purple color and shiny surface of its leaves.

A truly dark-leaved basil had long been desired by growers to supersede an existing form with uneven traces of purple. After a thorough search of commercial seed houses proved fruitless, a review of a list of U.S.D.A. introductions revealed a purple-tinged basil from Turkey. Some seeds were obtained. Then followed years of intensive inbreeding and selection at the University of Connecticut to achieve the desired result: a bush-type plant which grows from 12 to 15 inches tall by about 12 inches wide, has a uniform dark purple color and comes true from seed. The flowers are small lavender spikes which contrast with the glossy dark foliage.

In 1962, 'Dark Opal' was submitted to the All-America Selections and was awarded the Bronze Medal.

The plant is pleasantly aromatic and can be used in cooking whenever basil is called for. Its flavor is slightly more intense than the familiar green varieties.

In the garden, 'Dark Opal' is a handsome complement to rose, pink, light lavender or white petunias. The dark bronzy color of the foliage reflects an iridescent sheen whenever a breeze stirs it, and provides a striking contrast to mass plantings of wax begonias, verbenas, zinnias or similar bedding plants with flowers in pastel tones. Because of its neatly tailored, compact growth, it is excellent for a low hedge along a walk or bordering a terrace or patio.

The culture of 'Dark Opal' is as simple as that of all basils. It can be successfully grown in any sunny location with good garden soil. For deepest color, remove the flowering spikes as they form. It is a true annual and completes its growth cycle after flowering and seed production. ◆

George Taloumis

A strawberry jar has been planted with the more common forms of sweet basil.

BOXWOOD

George Taloumis

Low-growing varieties of boxwood are often sheared to form miniature hedges along walks or to enclose flower or herb plantings. The foliage is so dense that all stems are hidden.

The Classic Shrub for Herb Gardens

George S. Avery

THE FAME of boxwood as an evergreen shrub of ornamental distinction is well deserved. Its fine-textured, lustrous, dark green foliage is unrivaled as a strong background for flower borders. A group of boxwood makes a handsome frame for a main entrance. Placed at the corner of a house, the rounding form of boxwood softens a stark structural line and helps the building blend into its surrounding lawn.

I recall seeing a charming use of boxwood on a long gentle slope in an English garden. It consisted of a series of terraces separated one from another by boxwood hedges. The hedges were sheared to stand 6 or 8 inches high on the side of the upper terrace, and twice this height on the terrace below, as shown in the accompanying sketch. Each terrace was about 10 feet wide with colorful borders of low-growing flowers along the shorter hedge. Unseen, the woody boxwood stems rooted in the face of the vertical earth bank and held it so securely that no masonry retaining wall was needed.

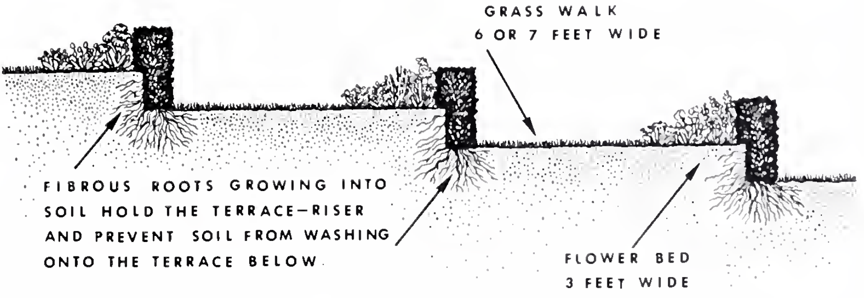
Low-growing varieties of boxwood can serve as edging for flower beds and walks, either in billowy masses if left to grow naturally, or clipped into miniature formal hedges. The habit of boxwood is so dense that stems and branches are completely hidden under a close carpet-like mass of tiny leaves.

Growing Conditions

For best results, boxwood should be given a sunny exposure or, at most, light or partial shade. In moderately heavy shade, boxwood grows open and leggy, thus losing the qualities that make it an outstanding ornamental.

Boxwood is indifferent to soil acidity or alkalinity but has rather definite limits of hardiness in cold climates. English boxwood (*Buxus sempervirens*) is not rated reliably hardy north of Zone 6 (Arnold Arboretum Map). However, some exceptional varieties have been discovered thriving in Zone 4. One example is 'Inglis,' originally found on the estate of Mrs. John Inglis, Ann Arbor, Michigan, where it reportedly underwent temperatures of −20 degrees without injury. Another is 'Vardar Valley' which is successfully grown in the herb plantings at the Boerner Botanical Gardens near Milwaukee, Wisconsin.

Less hardy varieties may be given an extra margin of resistance to cold by selection of a favorable microclimate and by simple protective measures. Cold climate precaution: do not fertilize after early spring, as soft growth will certainly


GRASS WALK
6 OR 7 FEET WIDE
FIBROUS ROOTS GROWING INTO SOIL HOLD THE TERRACE—RISER AND PREVENT SOIL FROM WASHING ONTO THE TERRACE BELOW
FLOWER BED
3 FEET WIDE

Eva Melady

be winterkilled. Evergreens should be well watered in dry autumns—send them into winter wet, as the saying goes—yet soil must always drain quickly and never remain waterlogged.

Winterburn, a browning of evergreen leaves, is caused by loss of water which roots are unable to replace when the ground is frozen. The shallow, fibrous root system of boxwood is an asset in transplanting, but lack of deep roots makes the plant especially vulnerable to damage when free water is not available in surface soil. Water loss from the leaves is accelerated by direct sun and by wind. Protection against winter sun, either by planting on the north side of a building or by shading with burlap, will materially reduce winterburn.

There are many kinds of boxwood, some superior, others less worthy. It is advisable to study a collection of different sorts, preferably in a climate similar to your own. Such collections are found in botanic gardens and on the grounds of specialist growers such as the late Mrs. Lewis Frances who grew fifteen or twenty varieties in her Cape Cod garden. While the garden was designed primarily for beauty, it also served as a testing ground of performance and desirability.

The common boxwood (*Buxus sempervirens*), so much admired by visitors to Colonial Williamsburg, came to England from southern Europe. In its long history of cultivation, many varieties have been selected and named. One of these, *B. s.* 'Suffruticosa,' commonly called True Dwarf Box, stands high on my list. In the nearly thirty years I have grown it, both in sun and in half shade, it has never failed to give me joy. It can be sheared or allowed to grow naturally when it will reach a height of 3 feet or more.

Another favorite is Kingsville Dwarf Box (*Buxus microphylla* 'Compacta'), selected many years ago by Mr. Henry

George Taloumis

Right: In this formal garden for a brick-surfaced terrace, boxwood serves as a low hedge for geometrically-shaped beds, which are planted with geraniums.

Garden behind the Cathedral at Chartres, France, has sheared boxwood enclosing beds of canna, geranium and dusty miller.

Alice Dustan Kollar

Hohman, proprietor of Kingsville Nurseries. It is lighter in color than the rich dark green 'Suffruticosa' and markedly dwarfer in habit. Plants of this variety have been in my collection for about thirty-five years. Set close together, they measure 12 to 15 inches high with a spread of 2 feet. Single plants grown farther apart, with less competition, should be nearly twice this size in the same length of time. They retain their tiny leaves and compact habit, although an occasional vigorous sucker shoot appears and should be cut out.

Littleleaf Box (*B. microphylla*), a native of Japan, is better able to withstand low winter temperatures than *B. sempervirens*. Its northern limit is considered to be Zone 5 but the use of microclimates and protective measures may extend its usefulness in more rigorous sections. This species and its varieties are often seen in gardens of the Great Lakes region.

Pests and Diseases

Box leaf miner, which causes small blisters on the underside of leaves, and plant lice which cause cupped terminal leaves, are controlled by the systemic pesticides Dimethoate (Cygon 2E) and Di-Syston, or by spraying with malathion. Twig die-back, a fungus disease, yields readily to Ferbam.

Boxwood as a Medicinal Herb

The sixteenth- and seventeenth-century herbalists, mixing facts (such as they were) with fancy, made great claims for boxwood. According to Maude Grieve's *A Modern Herbal*, extracts made from leaves and bark of boxwood, when applied to a bald head, were reputed to induce the growth of hair. An oil distilled from the wood was prescribed for epilepsy as well as for such diverse ailments as hemorrhoids and toothache. It was also said to have sedative and narcotic properties, to promote perspiration, and to treat venereal disease, leprosy and rheumatism. The leaves and sawdust boiled in lye were used to dye hair an auburn color. The leaves are considered poisonous to animals but, in powdered form, were administered to humans as a cathartic and vermifuge. No evidence is available as to whether a patient would or could live through a vigorous course of boxwood therapy. ◆

Herbs are the dominant ornaments in today's traditional arrangements

HERBS IN DRIED BOUQUETS

Mary E. Baer

WHEN the restoration of Colonial Williamsburg in Virginia was realized, Louise Fisher revived the eighteenth-century use of dried plant material for decoration. Taking her inspiration from old paintings and floral prints, Mrs. Fisher created colorful mass arrangements—"winter's pleasant ornaments"—as historically authentic decorations for the restored homes and public buildings.

Tower Grove House, country home of Henry Shaw, founder of the Missouri Botanic Garden, was opened to the public in 1954 as a living museum. This historical landmark, built in 1849, has been studiously restored to its Victorian grandeur. The stately rooms provide an ideal setting for dried arrangements, prepared by the same methods used in Williamsburg.

The harvesting of plant material begins with spring's awakening and ends in autumn's last splash of vivid color. Herbs and flowers from the garden, wildlings from the countryside—leaves, grasses, seedpods and ferns—are gathered in quantity. Unwanted leaves are stripped from the stems. For a variety of curving or straight stems, dry some of the material standing upright in an empty container and some hung head downward in small bunches, securely tied, in a dark dry room.

The earliest blooms to gather from the countryside are white yarrow (milfoil), then Queen Anne's lace and rosettes of velvet gray-green mullein, which later produces spikes of small yellow flowers. Dock, cattails, milkweed pods, Joe-pyeweed and teasel are followed in early autumn by the bonesets and goldenrods, which should be harvested both in the bud stage and in full bloom. The last two should be gathered in generous amounts as they are invaluable fillers in dried bouquets. Pearly everlasting (*Anaphalis margaretacea*) should be picked in bud.

The garden provides large white clusters of summer-heliotrope (*Valeriana officinalis*), baby's-breath, the buds of lavender and blue salvia, spirals of ambrosia (*Chenopodium botrys*), also known as feathered-geranium, clusters of yellow tansy buttons, flowers of the mints, the silver-white disks of honesty, and the red-orange fruits of the Chinese lantern plant.

Outstanding gray-white foliage plants include lamb's-ears (*Stachys lanata*), licorice (*Glycyrrhiza glabra*), santolina and the artemisias 'Silver King' and dusty miller (*A. stelleriana*).

The flower border is a source of richly colored material: the rose-pink and yellow heads of yarrow, blue globe-thistle, plumed and crested cocks-combs in pink and red, straw flowers (to be cut in bud), statice and the white, pink and purple blooms of globe-amaranth. All of these are hung head down to dry.

There is an infinite variety of seed heads—those of ornamental grasses, grain, colorful ears of corn and cattails. Pick when ripe and dry upright.

Among the shrubs, beauty bush (*Kolkwitzia amabilis*) is collected both for its pink cascades of flowers and later when its bristly reddish brown seed heads form. I pick great quantities of salt-bush or silverling (*Baccharis halimifolia*) for the sake of its glistening masses of silky white down. Salt-bush must be picked in

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Of interest to Midwestern gardeners is a 32-page booklet, *How to Grow Herbs in the Midwest*, published jointly by the St. Louis Herb Society and Missouri Botanical Garden. It is available for $1.00 from the Missouri Botanical Garden, 2315 Tower Grove Ave., St. Louis, Mo. 63110.

A Victorian arrangement made by the author for the parlor mantel of Tower Grove House. The Paris vase in brown, gold and white contains a variety of material: yarrow, goldenrod in the fluffy stage, boneset, licorice, salt-bush, allium and accents of hydrangeas in pink, green and beige and brown fronds of the Christmas fern.

Claude Johnston

September at the precise moment of ripeness. If picked in bud, it will be underdeveloped when dry. A few days later, when it breaks into mature bloom, make haste to gather it. If you delay, the fluff will scatter broadside.

Hydrangea macrophylla in pink, blue and white (or brown in late autumn) and the oakleaf hydrangea (*H. quercifolia*), which should be picked when pink, are invaluable in mass arrangements. Kolkwitzia, salt-bush and hydrangeas should all be dried standing upright.

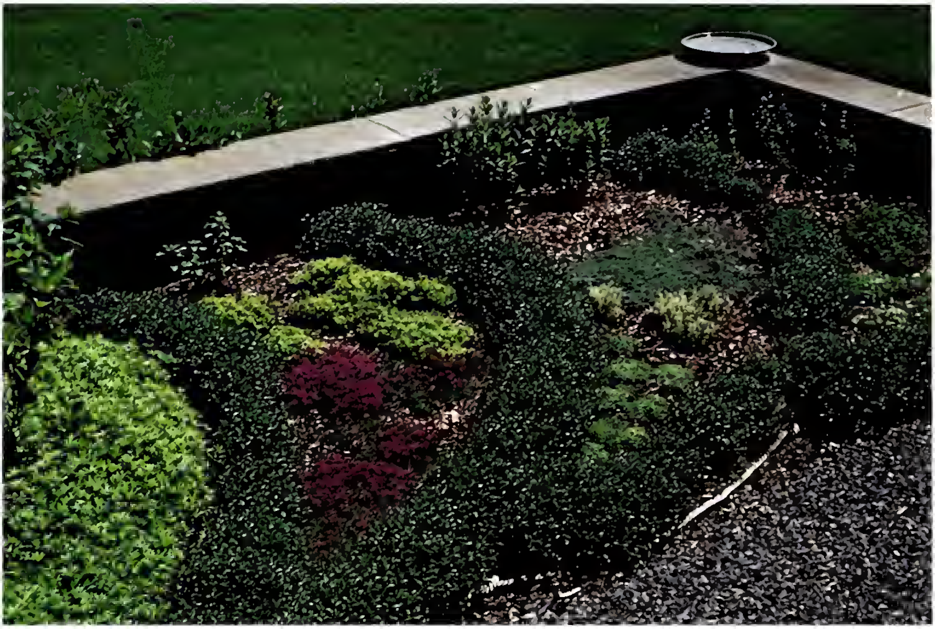
Leafy branches of trees such as *Magnolia grandiflora* and copper beech can be preserved by use of a solution of equal parts of glycerin and hot water. Cut the branches no longer than 3 feet, bruise the cut ends, and stand them in a container holding 8 inches of the solution until absorption is complete.

The mature leatherlike fronds of Christmas fern, when given the glycerin treatment, turn a lovely warm brown. Originally erect, they assume their graceful ostrich-plume curves in the vase, possibly due to the influence of artificial heating. Other ferns of less substantial texture, and branches of highly colored early autumn leaves can be pressed between layers of absorbent paper with a weight on top.

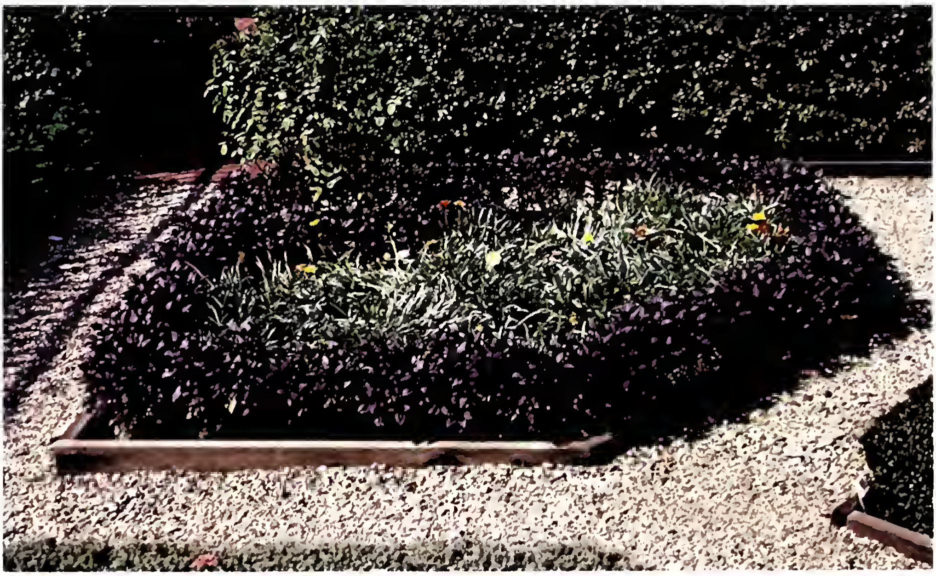
With your harvest dried and your vase filled with slightly moistened sand as a holder, you are ready to create your own "winters pleasant ornament." ♦

Herbs are suited to informal, carefree use, too. Here, a sundial is surrounded by thyme and clumps of chives (*Allium schoenoprasum*).

Nelson Groffman



This formal herb garden's design, which is formed by a series of curving hedges of germander, is pleasing and graceful, yet not as intricate nor as difficult to maintain as are most knot-garden patterns. Of course the germander plants require regular clipping to keep them compact and rounded.



Herb plants need not be confined to herb gardens. Here the attractive purple-leaved basil 'Black Opal' forms a border for a five-sided plant bed of gazania. Strips of wood form a permanent frame for the bed and keep out gravel from the surrounding paths. Basil is one of the most decorative of culinary herbs.

Photographs by George Taloumis

Decorative and functional uses of herbs indoors

COME INTO MY KITCHEN

Josephine DeCiantis

LET ME COUNT some of the ways the "still room" of our 1790 Connecticut farmhouse reflects my interest in herbs and the joy of cooking with those I've grown.

A wreath of artemisia, decorated with bay, rosemary and nutmegs, welcomes you at the kitchen door, while another one inside provides snips for cooking. A small wreath of dried sweet woodruff adds the scent of new-mown hay. A swag of pomanders, nuts, onions, dried peppers and herbs hangs on the chimney next to my copper pans. A wooden bowl of potpourri made from crushed and cracked anise, cinnamon sticks, allspice, nutmeg and vanilla beans in coarse salt gives off a spicy aroma.

A catnip mouse delights the cat and a tussie-mussie of fresh herbs or a bag of dried tansy, wormwood, southernwood and rosemary tied to the dog's basket helps keep away fleas. Wooden boxes and firkins stained with herbal dyes have a soft and subtle color. Green and brown wine bottles hold herbal oils and vinegars, which are used in mixing salad dressings. For those who prefer lemon juice to vinegar, flavor may be supplied by salad oil in which herbs have been steeped. Herbal oils are also useful in cooking. Marjoram or rosemary for beef fondue gives a double bouquet of flavor and aroma.

From the lovely herbal print materials now available, you can make an herb-stuffed tea cosy for your herbal teas. The heat of the pot releases the aroma as it does also with herb-lined pot holders. In addition to the conventional square ones, you can make sleevelike padded covers for the handles of cook-and-serve pots; or double pads for lifting large casseroles (a long strip of padding with an oven mitt at each end) that will protect the user's arms and body from possible spills. A

John DeCiantis

A miscellany of herbal products and crafts in the author's kitchen. Included are a tea cosy with dried herbs in the lining; pot holders; a catnip mouse in front of the teapot; spice balls on tea towels embroidered with herb motifs.

cloth case filled with bayberries helps your iron to slip—fragrantly!

A friend embroidered herbal motifs on tea towels of natural linen. Another friend, a potter, made ceramic tiles using pressed leaves in silhouette under the glaze. A pottery teapot can be decorated with a spray of herbs cut into the bisque before glazing. Those unskilled in needlework or pottery can beautify a big kitchen wastebasket with a collage of herb seed packets, or with a burlap base and a glued applique cut from an herbal print.

A tiny basket filled with sphagnum moss and herb clippings always sits on my windowsill, ready to take to a friend. Sweet and bracingly pungent aromas, the variety of form and color of foliage and flowers, and the tactile delight of fingering leaves such as the velvety peppermint geranium, bring a breath of freshness to any sickroom. As an added benefit, the cuttings will usually root and be the start of a new herb garden.

For Christmas, the kitchen table always features a rosemary tree decorated with kumquat pomanders, star anise, tiny baskets of spice seeds, gingersnap cutouts and spice balls. Spice balls are made by thickening the pulp of baked apples with ground cinnamon, nutmeg, clove and orris root, then rolling the mixture between the palms. Before the balls harden, a hole is poked through them with a skewer or steel knitting needle. When thoroughly dry, a loop of ribbon is threaded through the hole and secured at the bottom with a whole clove.

There is no end to ideas for the decorative use of herbs. If you try a few, you may be introduced, as I once was, as "the woman whose kitchen smells—GOOD." ◆

Christmas in the author's kitchen. A potted rosemary, decorated with miniature ornaments, is surrounded by such herbal gifts as bottles of herb-flavored vinegars, jars of jellies and condiments, wreaths of dried herbs and loaves of tea cakes.

For beauty and utility, herbs deserve a place in the vegetable garden

HERBS AS ORNAMENTALS FOR THE VEGETABLE GARDEN

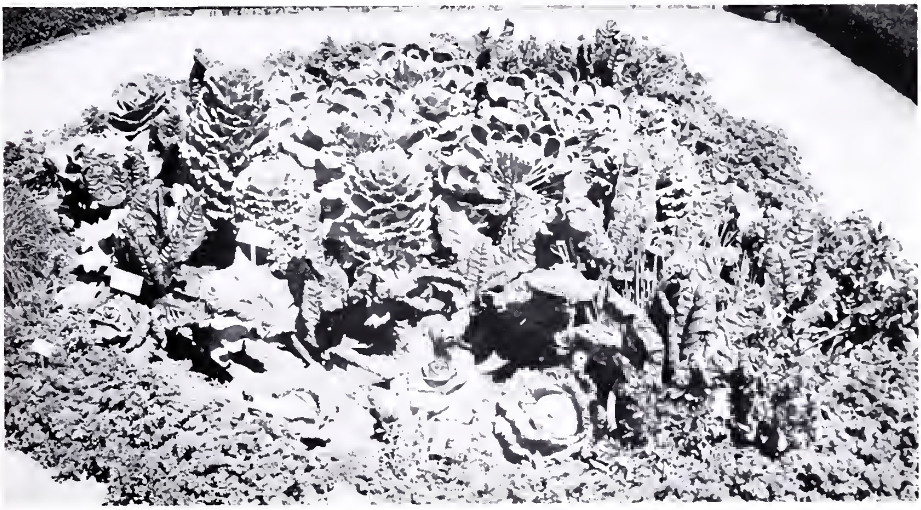
Minnie Worthen Muenscher

MANY HERBS can add pleasure because of their fragrance, foliage or flowers, and at the same time be gathered as needed in the kitchen. They can be used as a border surrounding the garden, in the corners, or among the vegetables.

The tubers of Jerusalem-artichoke (*Helianthus tuberosus*), a close relative of the sunflower, are a crisp addition to a tossed salad in the cold months of the year. They may also serve as a potato substitute, especially in a diet for diabetics. Jerusalem-artichoke (not to be confused with the common artichoke *Cynara scolymus* one sees in markets) has many bright yellow, daisy-like flowers on stalks that grow up to 12 feet. The flowers of this giant perennial give color to the late summer and autumn garden. Plant Jerusalem-artichoke on the north side of the garden to avoid shading the vegetables, and give them plenty of space because they spread rapidly.

The scarlet flowers of Oswego-tea (*Monarda didyma*), also known as bee-balm or bergamot, provide color and fragrance in the same corner of the vegetable garden. They will also attract any hummingbirds that are in the vicinity. This summer-flowering perennial grows to 3 feet or more and is also a spreader.

Sweet fennel (*Foeniculum vulgare*), treated as an annual in colder parts of the country, is a striking contrast to Oswego-tea. It resembles dill in its feathery leaves and loose yellow flower-



Boerner Botanical Gardens—Whitnall Park

The Salad Bowl is a part of the Herb Garden of Boerner Botanical Gardens (Hales Corners, Wisconsin) and features colorful varieties of kale, cabbage and Swiss chard. The bed is surrounded by an edging of curley parsley. (See also page 67.)

Gottscho-Schleisner

The variety of Swiss chard known as Rhubarb Chard, because of its red stalks, and bright-green curly parsley make an eye-catching border along a walk.

Marjorie J. Dietz

The path through this home vegetable garden is bordered on both sides with chives. Other culinary herbs in the garden include summer savory, marjoram and oregano.

heads on 4-5-foot stems. The enlarged base is eaten like celery; the leaves are used for salads or greens, and the seeds for seasoning. All parts of the plant have an anise flavor.

One or more of the many mints, planted in the opposite corner, will be decorative, especially when crowned with tall spikes of purplish flowers in summer. Spearmint (*Mentha spicata*), peppermint (*M. piperita*), or apple mint (*M. rotundifolia*), can give a lift to the spirit equal to the bracing effect of a cup of mint tea. Mints have spreading rootstalks, and unless kept in check will take up a greater amount of space each year. One way to restrain their increase for a few years is to plant them in large bottomless cans sunk into the ground, with the rims set just at or slightly below the surface of the soil. Plant height is 2 feet or more.

In the corner with the mints, a plant of sage (*Salvia officinalis*) contributes its characteristic pungency and beauty with its gray-green leaves and spikes of purplish flowers. Sage, also a perennial, will grow about 2 feet high. Pineapple sage (*S. rutilans*) should be included for the sake of its brilliant red flowers in late summer and autumn. It is not winter hardy but cuttings rooted in water will insure enjoyment of its rich pineapple odor throughout the year. Two low-growing perennial herbs for the front of this corner are wild marjoram (*Origanum vulgare*) and thyme (*Thymus vulgaris*). Both form mounds 2 feet or more wide of pungent leaves and bear pink or rosy purple flowers over a long period in summer.

At the other end of the vegetable garden, plant annual herbs. A bed of calendulas and one of dwarf nasturtiums will add gay color throughout the summer if they are not allowed to set seed. Calendula (*C. officinalis*) is chiefly grown for its brilliant yellow or orange flowers. The petals can substitute for saffron in rice recipes and also supply traces of color to soups, stews, salads and desserts. Nasturtiums (*Tropaeolum majus*) are both useful and beautiful. The leaves, stems and flowers add a peppery flavor to salads; the flowers are colorful in cool drinks; and the pickled seeds are used in place of capers. Salad burnet (*Sanguisorba minor,* now referred to by botanists as *Poterium sanguisorba*) would make an attractive border for the corner bed. The lacy, deeply toothed leaves of this perennial herb are green much of the year. The cucumber-flavored leaves are used in salads and beverages.

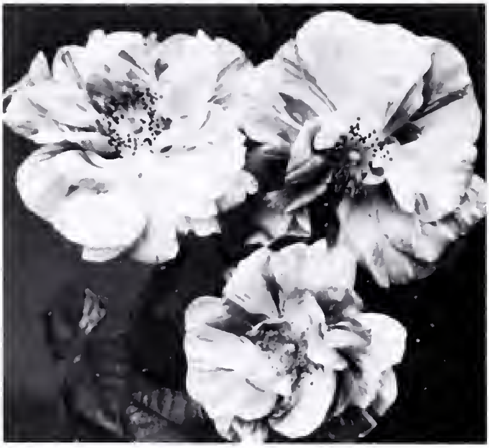
Don't forget the familiar kitchen herbs, either. Annual culinary herbs and those best treated as annuals—basil, summer savory, sweet marjoram and parsley—give flower contrast and foliage texture to the vegetable garden. Their presence is entirely appropriate as many of them are used in salads and in cooked vegetables. ◆

Marjorie J. Dietz

Angelica plants, with soaring flower umbels, atop stems nearly 6 feet tall, make impressive accents in an otherwise commonplace vegetable garden.

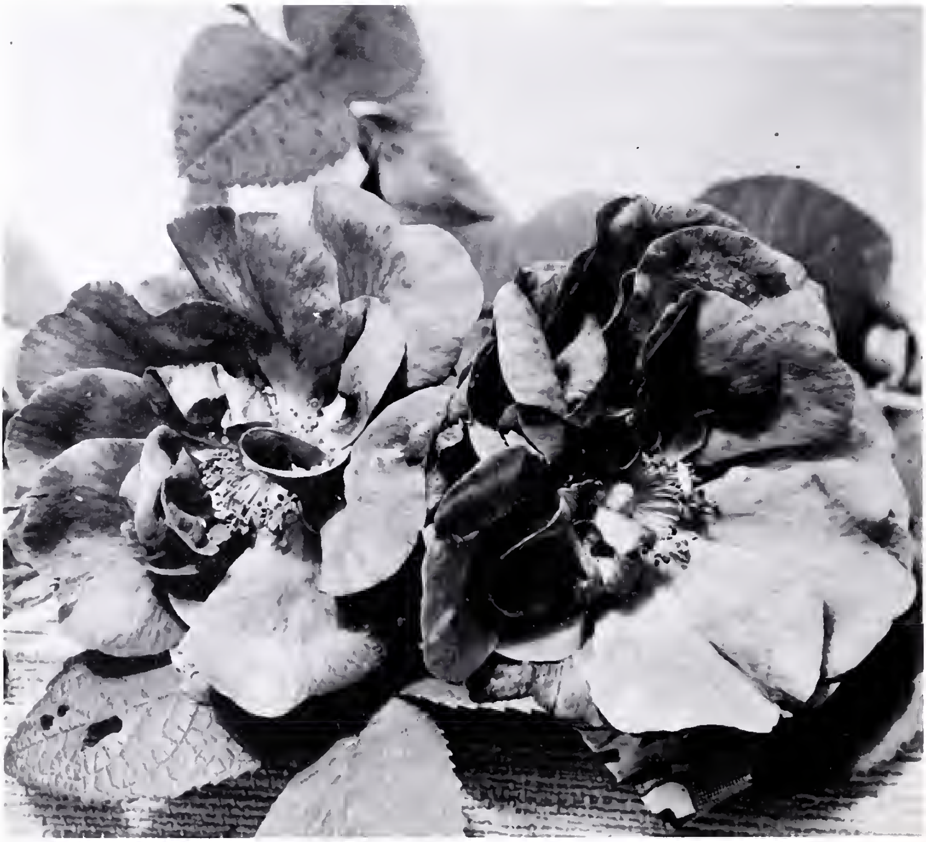
ROSES OF THE HERBALISTS

M. M. Graff



Left: *Rosa gallica versicolor* Rosa Mundi. *Below:* The Red Rose of Lancaster (*Rosa gallica officinalis*).

G. S. Thomas



A Legacy of Fragrance

Graham Thomas

FEW PLANTS have so long an association with our civilization as the rose. Along with the iris and the lily, it was long before years were numbered depicted and recorded by the ancients as an emblem of beauty and a source of inspiration in design. These three flowers have one thing in common: fragrance.

In the early gardens of the East, the initial value of plants to mankind was their medicinal and culinary properties, then fragrance and lastly, the eye. We know that herbs were garnered for their lasting fragrance when dried. One rose in particular, *Rosa gallica,* can excel the iris and the lily in its priceless attribute of retaining fragrance in its dried petals.

Roses for Potpourri

Through hundreds of generations, this attribute is still in some part present in our modern roses, and petals of all kinds are used for potpourri today. But those who wish to make this concoction would do well to consider roses of the distant past. It is a comforting thought that, in the race for ever bigger and brighter blooms, the gardeners of the last hundred or more years have seen fit to preserve this ancestral heirloom, *Rosa gallica*, and its early hybrids. Wild forms are still in cultivation which may be the same as those reported to have been religious emblems of the Medes and Persians.

The Red Damask

Our most famous ancestral rose, however, is the semi-double form believed to have been brought to Europe by the Crusaders. For long known misleadingly as the Red Damask—because it was brought from Damascus—its actual origin is obscure. It became the source of considerable revenue in Provins, France, and in Surrey, England, for its dried petals used in conserves. It is an attractive, compact bush with tiny thorns but no prickles, and bears its several-petaled flowers well aloft on stiff stalks. Whether in its original carmine-pink or light crimson type or its spectacular sport, Rosa Mundi, variously striped and splashed with blush, it is a conspicuous shrub in the garden landscape for some four or five weeks at midsummer. Believe me, it is a worthy garden plant for the sake of its display of a hundred or so blooms, after which I feel it has done its bit for another year. Is not the same true of many a popular flowering shrub? We are so greedy nowadays that we demand that our roses shall go on flowering until autumn. Yet we should not forget this valuable old rose, so closely connected with mankind over the centuries for its culinary and other properties—even if it had not achieved notoriety as the Red Rose of Lancaster in the Wars of the Roses. So there is a brief picture of *Rosa gallica officinalis,* the Apothecary's Rose, Red Rose of Lancaster; and its sport, first recorded in the sixteenth century, *R. g. versicolor,* the Rose of the World, Rosa Mundi.

The Damask Rose

At some past distant time, it is believed that *Rosa gallica* became cross-pollinated with *R. phoenicea*, a totally different type from Turkey and Syria. *R. phoenicea* is not a worthy or hardy garden plant, being small flowered yet very fragrant, usually with white flowers rather like those of *R. multiflora.* The result of this supposed cross is the Damask rose, *R. damascena.* One of the precious liquids and cure-alls of the ancients was rose-water. The Damask rose, in its various forms, is most favored for distilling rose-water in Eastern countries. If you can imagine the soft flavor and fragrance of the pink-colored portions of Turkish Delight or Marsh Mallow—always assuming that some chemical substitute has not been used instead of the true extract—you will have an idea of the appeal of

M. M. Graf

A deep rose-pink form of the Damask rose (*Rosa damascena*). The Damask rose is used in Eastern countries for distilling rose-water.

rose-water. In Bulgaria particularly, hundreds of acres of Damask rose—often surrounded by a hedge of *R. alba*—are grown in the warm sheltered valleys around Kazanlik. We can only imagine the heady fragrance that blows over the plantations, cooled by mountan streams and warmed by the spring sunshine. No doubt huge distillery vats contribute to the sweetened air. The rose used in Bulgaria is practically identical with the type known as *R. damascena trigintipetala*, a lanky, prickly shrub of doubtful garden value, bearing loosely for a short season double pink blooms amid soft grayish leaves.

R. damascena trigintipetala, or a closely related form, probably gave rise to a sport or seedling which we know as *R. d. versicolor*, or 'York and Lancaster.' This is again a rather weak, tall plant whose flowers are white, pink or parti-colored. It was recorded by John Parkinson in 1629, but whether Shakespeare knew it there is no real proof, only supposition.

It is difficult to imagine the culling of some three tons of blooms of Damask rose, from four to five acres of plantations, in order to extract a mere two and a half pounds of attar. Yet this is the information sent me from Bulgaria, where the sale of this very precious liquid is a large source of income. Attar is an oily substance which rises from the distilled rose water, and its fragrance is lasting and sublime. At one time it was literally worth its weight in gold. (The extract from *R. alba* is not so treasured.)

Recalling the Phoenician rose, there is another related species, the European *R. moschata*, which has also had a great and recurring influence on rose breeding. This species and *R. multiflora* from Japan belong to the group known as Synstylae, from their characteristic of having the styles united into a column in the centre of the flower.

It is believed that at some time *R. moschata* became united also with the Damask rose, and the result is known as *R. d. bifera*, the Autumn Damask. Inheriting the recurrent-flowering habit of *R. moschata*, this is otherwise the only one of the ancestral roses that produces a second crop in autumn. We believe that our *R. d. bifera* of today is identical with the twice-flowering Damask of Roman days. Quantities of blooms of this rose were needed for autumn feasts. It is said that some were imported from the warmer climate of Egypt—surely the first export trade in roses?

There are two more roses of the Synstylae section that we should recall: the Japanese species *R. multiflora* and *R. wichuraiana* the memorial rose. Both are ancestors of our garden ramblers and often have transmitted their marked and far-reaching fragrance, as in 'Blush Rambler,' 'Sanders' White,' and the 'Alberic Barbier' group. It is worth noting that in these roses the scent is found in the stamens, not in the petals as in other roses; and it is noticeably free, carrying for many yards in the air. ◆

KNOT GARDENS

A design of interlacing bands of low-growing, compact herbs

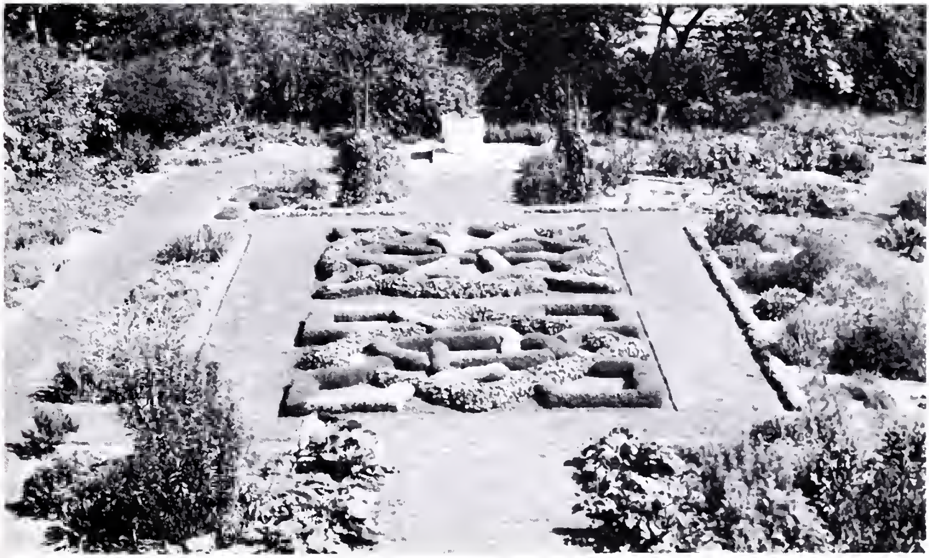
Bernard Currid

KNOT GARDENS originated in Europe and were in vogue in England in the sixteenth century. Probably the best known of all is at Hampton Court, near London. Many others still survive in Old World castle gardens, where they are particularly striking when viewed from a tower or high terrace. The knot gardens at the Brooklyn Botanic Garden, constructed in 1938, are replicas of very elaborate sixteenth-century designs. Although the Garden has no medieval tower from which to view them, these gardens clearly have a special appeal for the million-and-a-half visitors who see them each year.

There is a place for a knot garden around modern homes, where there is no sharp distinction between indoor and outdoor space. Such a garden can be a decorative feature outside a large breakfast-room window or associated with a dining terrace. Knot gardens, it is true, require work, but in my experience their upkeep is less than that of a carefully maintained lawn. Also, the key plants usually grown in them are perennials, indicating some degree of permanence beyond short-lived annuals.

Before one sets out to make a knot garden, it is imperative to draw a plan to scale. The design may be traditional, as at the Brooklyn Botanic Garden, or as original as one's artistic imagination can create. It is helpful to color the plan to indicate the under-and-over effects of various strands.

In order to transfer the knot garden plan from paper to the soil, mark off both the plan and the plot in corresponding squares. When the chief intersections are staked out, it is easy to mark the outlines



Louis Buhle

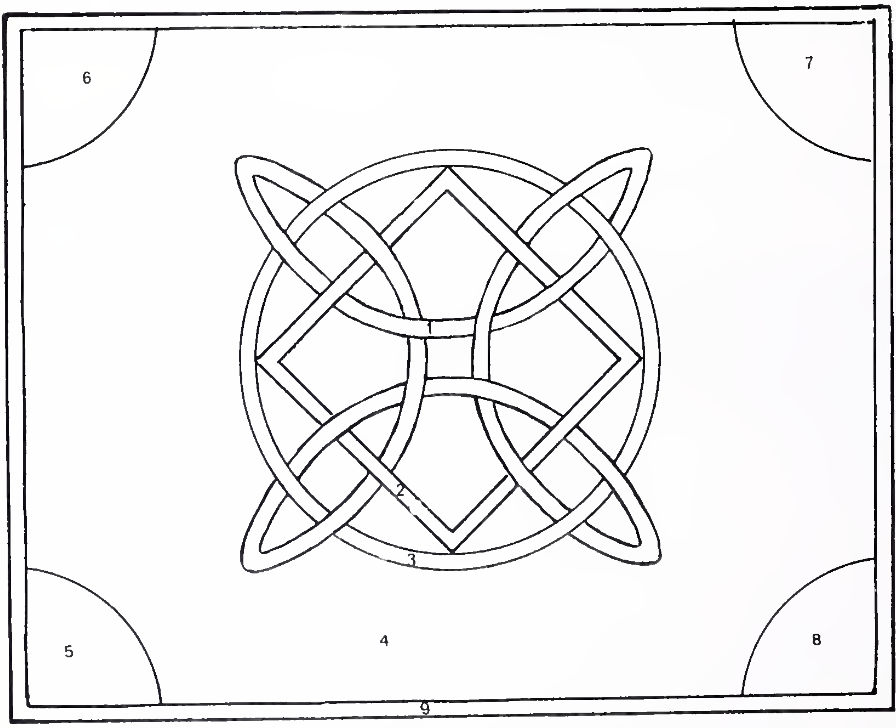
The knot gardens of the Brooklyn Botanic Garden are replicas of elaborate sixteenth-century designs. The herbs in any knot design must be compact in habit.

Arvid Zumwalt

Using lime to outline knot design.

of the figures with sand or lime.

Most of the common herbs, including ones used in knot gardens, require a light, well-drained soil in full sun. Heavy soil should be deeply dug and its texture improved by the addition of coarse sand and organic matter such as peat moss. Similarly, a generous amount of organic matter should be incorporated into excessively sandy soil. The herbs most often used in knot gardens do not thrive in distinctly acid soil. If your soil is very acid, as it is in much of the eastern United States, send a sample to your local state experiment station or county agent for analysis. The report will specify the quantity of agricultural limestone to add in order to reach the desired pH,

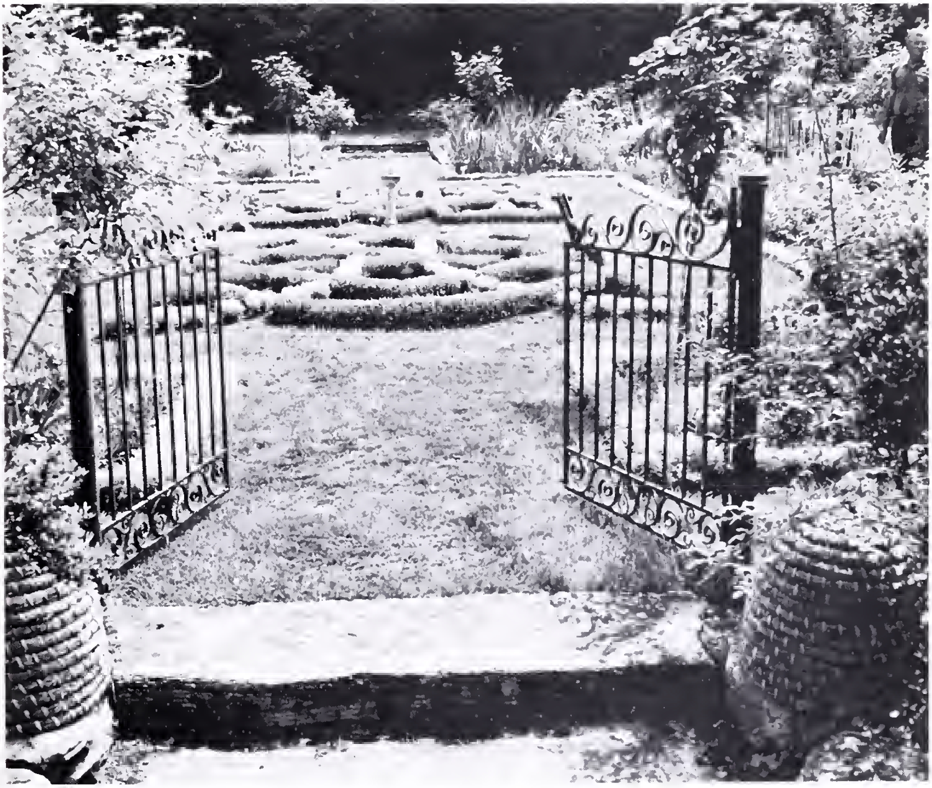


A simple sixteenth-century knot garden suitable for today's gardens has been adapted by the New England Unit of the Herb Society of America. 1 Lavender 2 Green Santolina *(S. virens)* 3 Gray Santolina *(S. chamaecyparissus)* 4 White Thyme *(Thymus serpyllum* 'Albus') 5 A Corner Planting of Scented Herbs (Rose, Peppermint or Lemon Geranium); 6 and 7 Culinary Corners (Chives, Tarragon, Sage, Rosemary, Thyme) 8 Medicinal Corner (Lady's-mantle, etc.)

which should be between pH 6-7.

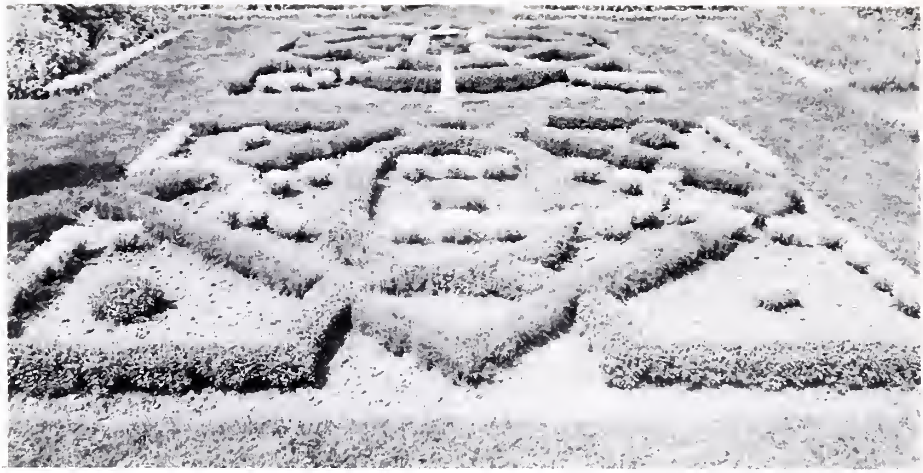
A light sprinkling of a commercial fertilizer with a high phosphorous content, as 5-10-5, can be mixed into the soil when the bed is prepared. If fertilizer is used after plants are in place, be sure that the foliage is dry so fertilizer will not stick to the leaves and cause burning. Caution: don't overfeed. Too much high-nitrogen fertilizer applied early in spring causes loose untidy growth and a lower concentration of the essential oils that give herbs their pleasing scent. On the other hand, fertilizer applied late in the growing season promotes soft, lush growth which will likely winterkill.

Herbs selected for a knot garden must be compact in habit, able to stand shearing, and sufficiently varied in foliage color to maintain the identity of each ribbon. We use gray and green santolinas (*S. chamaecyparissus*, *S. virens*), germander (*Teucrium chamaedrys*), winter savory (*Satureia montana*) and a form of lemon thyme (*Thymus citriodorus*) with leaves edged white. Other suitable plants include hyssop (*Hyssopus officinalis*), Roman wormwood (*Artemisia pontica*), edging box (*Buxus sempervirens* 'Suffruticosa') and golden variegated sage (*Salvia officinalis* 'Icterina'); also, dwarf forms of lavender. Differing leaf sizes and textures can add further contrast. For example, the large-leafed sweet violet (*Viola odorata*) combines well with tricolor sage (*S. o.* 'Tricolor'),



Arthur Norman Orans

Entrance to an Illinois herb garden with two center knot gardens. See page 60 for opposite end of the garden with a more detailed view of the "knots."



Arthur Norman Orans

Opposite end of herb garden on page 59. It features two knot gardens.

which has intermediate-sized leaves marked with light green, cream, and mulberry pink. Of course, sweet violets have a free-seeding habit and unwanted seedlings should be removed while still small.

Set the plants at the depth they grew in the nursery, and space them 3-4 inches apart according to size. When the various combinations are planted, the garden now has the appearance of interwoven knots. The spaces between the strands can be filled with coal chips, broken clay flower pots, and marble chips, as is done at the Brooklyn Botanic Garden, or with bark mulches of different textures.

In some knot gardens, small specimen plants are placed within the knots for additional contrast. Suitable plants for this purpose are hairy-stem thyme (*Thymus lanicaulis*) which has a bluish tinge; burstwort (*Herniaria glabra*), bright green and mosslike in appearance; pennyroyal (*Mentha pulegium*) with a pungent minty odor; lady's mantle (*Alchemilla vulgaris*) and the usual kitchen herbs: curly parsley, basil, chervil, chives, marjoram, and thyme.

Maintenance

Newly set herbs must be watered well until established, and afterwards as required. As the plants grow, they should be sheared back to uniform height. A light clipping about every two weeks, beginning in late May or June and continuing through July—no later for woody herbs like santolina and lavender—has been more satisfactory for us than infrequent heavy shearing. However, in very early spring established plants are pruned back sharply. Key point: plants often suffer a shock when pruned in hot weather, so water them well for several days to prevent sunburning.

After the soil freezes, mulch the garden with a light covering of marsh hay or evergreen boughs. In early spring, about the time crocuses bloom, start removing the mulch gradually. If winterkill has left gaps, as it is apt to with green santolina in New York, replacements will be needed. We have found it a good precaution at the Botanic Garden always to have a few spare plants on hand in the coldframes.

Knot gardens, like parterres, may have begun as ornaments for castles and palaces, but they are quite as well adapted for the home garden. In the words of an early seventeenth-century writer, Gervase Markham, "Let the gentry have their far-flung orchards, their extensive knot gardens and ribbon beds and fountains; the average person need not be ashamed of a little knot made of clipped lavender or some such other easily grown herb." ◆

HERBS IN COMBINATION

The placing of plants for contrast of shape, color and texture

Charlotte Erichsen-Brown

FLOWERS are but "the joys of the plant," with us for a few weeks only, while the leaves often persist all year. Herbs offer diverse forms and colors of foliage. There are shades of green from yellow through gray to blue and purple. There are silver-leaved herbs and a few with variegated foliage. With these as your palette, your garden can be vibrant with color at all seasons.

Herbs can be used throughout the garden, in front of and among shrubs, around foundations of buildings, along paths, on terraces, and in the borders, as well as in the vegetable garden and orchard.

Scale and Proportion

It is important to consider the scale and proportion of the plants in relation to the size of the garden. For a limited space, the lighter, more delicate-looking ones are suitable: artemisias, fennel fumitory, rue. An illusion of distance and perspective can be gained even in a very small space by the placement of different shades of green. For example, a tall mass of blue-green foliage looks well behind a lower mass of yellow or bright green. Another planting may consist of rue (*Ruta graveolens* 'Jackman's Blue') behind a mass of golden sage (*Salvia officinalis* 'Aurea') with Silver King artemisia (*A. albula* form) on either side. The artemisia needs constant pinching to keep it stocky. (The roots of some artemisias must be checked to keep them from crowding their neighbors!)

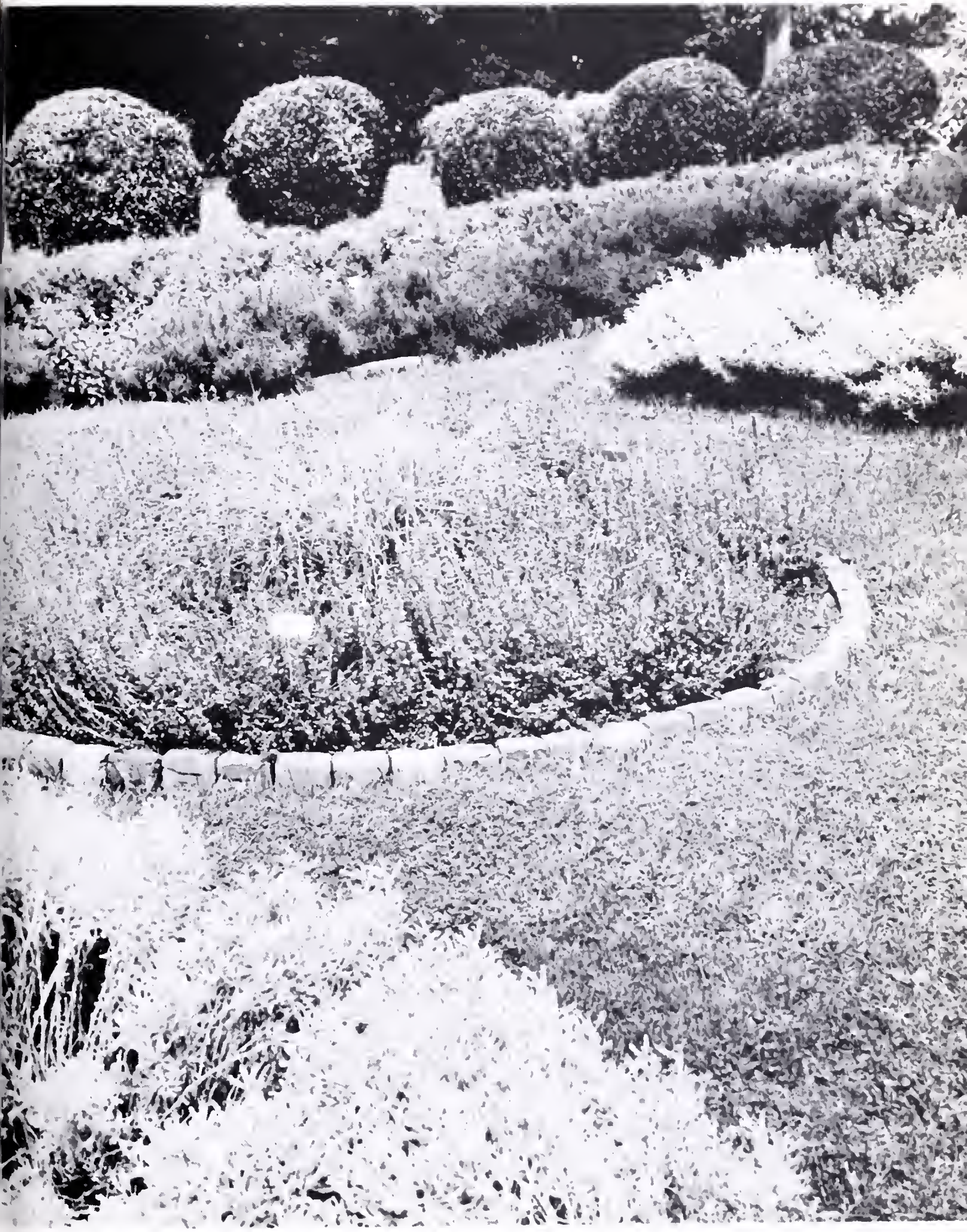
One delightful combination is that of a China rose or two among rosemary plants. The tender pink of the rose goes well with the dark, dull-surfaced rosemary foliage. Around the skirts of the rosemary mass *Salvia officinalis* 'Tricolor,' charming in its delicate green, pink and cream spring dress.

(*Continued*)

Margaret Ohlander

Gray-leaved santolina plants make a handsome border for a bed of geraniums.

Marjorie J. Dietz



The herb garden at the Thomas Halsey Homestead in Southampton, New York, as it appears in summer. The garden is maintained by the Southampton Garden Club.

Chives and lavender border a planting of hybrid roses. Organic gardeners believe that chives will discourage—if not prevent—aphid infestations on rose bushes.

Marjorie J. Dietz

This predominantly gray-blue garden border features catmint (*Nepeta* x *faassenii*), artemisia Silver Mound, lavender 'Hidcote,' yarrow and globe-thistle.

Gottscho-Schleisner

Enticing aromas and fragrance result from the mingling of many herb plants on this brick-surfaced terrace with a central feature of a spherical sundial or armillary.

For Shade

For a focal point in a sheltered corner, plant apple mint (*Mentha rotundifolia*) whose straight 30-inch stems and round, furry, apple green leaves shine with the early morning dew. A handsome companion is a mass of lion's-tail (*Agastache cana*) which has aromatic leaves and beautiful spires of glowing, deep rose flowers. It is a little tender, but is perennial in my walled garden in Ontario.

For Full Sun

An eye-catching combination for full sun features rose-campion (*Lychnis coronaria*), tall and stiff, with velvety leaves and magenta bloom. The finely cut, yellow-green leaves and pale gold buttons of the yarrow *Achillea taygetea* 'Moonshine' and the somber violet flowers of monkshood (*Aconitum napellus*) complete the triad.

Gray-blue Border

A gray-blue border, especially pleasing when it is encountered unexpectedly, provides a sense of coolness even on the warmest summer day.

All the truly blue flowers—campanulas, centaureas, chicory, flax, gentians, globe-thistle (*Echinops ritro*) and sea-hollies—show with increased effect when massed with silver-foliaged plants. The deep blue delphiniums and *Artemisia lactiflora* come immediately to mind.

A strong effect from July onwards can be created by combining globe-thistle, notable for its white-felted leaves and

Herbs in early summer combination are yarrow and lavender. The flat yellow flower heads of some yarrows are among the most lasting of all perennials. The flowers of lavender and nepeta are nearly as durable.

steely-blue flower heads, with *Salvia uliginosa,* whose kingfisher-blue flowers will be welcome in the fall. The stately velvety gray *Artemisia absinthium* may be added, but its flowers should not be allowed to form.

A low central feature in the garden could consist of herbs: *Allium sphaerocephalon,* with 12-inch spikes of pale to almost black-purple globes, mingled with the soft, silvery curry plant, *Helichrysum angustifolium,* whose flowers are burnished gold buttons in July and August. Pasqueflower (*Pulsatilla vulgaris*), with silver-silky leaves and gold-centered violet flowers in early spring, makes an excellent foreground for this grouping.

If your taste runs to sunny colors, you may prefer a yellow, bronze, and deep red border for light and warmth all year. Golden evergreens, shrubs, grasses and herbs make a strong showing against a dark green background such as a yew hedge. Golden feverfew (*Chrysanthemum parthenium* 'Aureum') is a very old border plant, producing its white daisies above boldly cut yellow foliage. Bronze iris and euphorbia, with brilliant yellow-green bracts, add to the monochromatic scheme in early summer.

For a tall background, *Rosa hugonis* and *R. rubrifolia* can be clipped and trained to fastigiate form. Both roses have red-purple stems. The leaves of *R.*

Boerner Botanical Gardens—Whitnall Park

Part of the herb borders in the Herb Garden of the Boerner Botanical Gardens, Hales Corners, Wisconsin. The Herb Garden is surrounded by a hedge and arbor. Visitors will find that all plants are labeled for identification of their origin and uses.

rubrifolia are tinged with the same warm color. In the foreground of the roses, plant clumps of bronzy-red heleniums for midsummer bloom and masses of red, bronze and yellow primulas for spring bloom. Golden marjoram (*Origanum vulgare* 'Aureum') can be set in front of the primroses in full sun.

Angelica archangelica is a noble 8-foot accent to draw the eye. Its creamy-white flat umbels of flowers are dramatic for use in church or hall. The three-part yellow-green leaves remain beautiful all summer if flowers are not allowed to form. The double-flowered form of celandine, with shiny yellow flowers and lightly cut, pale green leaves, makes an agreeable ground cover in front of iris and narcissus.

Angelica is a good choice to stand at one side of a gateway with shiny, dark green lovage (*Levisticum officinale*) on the other. The downy fernlike leaves and white flowers of sweet Cicely (*Myrrhis odorata*) look well at the foot of the lovage and thrive in its shade.

These suggestions of plant groupings are intended as a spur to the imagination, a hint of the bountiful plant material from which you can develop your own garden pictures to achieve "that best purpose of a garden, to find delight and give refreshment of mind, to soothe, to refine, and to lift up the heart." ◆

In the herb garden or border

ARTEMISIAS ARE THE GRAYEST PLANTS

Helen M. Fox

THE GRAY FOLIAGE of artemisia brings a soft cloudy or misty look which intensifies the depth of greens in mints and savories, the pink in carnations and the violet in lavenders. The effect is similar to a rainy day when colors appear brighter than when the sun shines.

Artemisias fall into two groups: those with feathery, threadlike foliage and those with almost entire-margined leaves.

Artemisias with Much-cut Leaves

Common wormwood (*A. absinthium*) is a well branched bushy plant growing to about 4 feet. The 2-inch, many-lobed leaves are velvety to the touch and show a strong undertone of green beneath their gray surface.

The semi-shrubby, finely haired southernwood (*A. abrotanum*) has stems clothed thickly all their length with sage-green leaves arranged in clusters of uneven lengths. This species grows to 5 feet and is such a vigorous spreader that it must be placed with care to avoid overgrowing more delicate plants.

Roman wormwood (*A. pontica*) spreads into wide mats by means of underground roots. Given good soil and drainage, it makes an admirable gray ground cover. Its erect wiry stems are clothed with threadlike leaves which look like delicate frost patterns.

The silky, shimmery Japanese wormwood (*A. schmidtiana*) may reach 2 feet in height. Its dwarf form 'Nana' is a delightful ornament for the rock garden as well as among herbs. Its low, soft hummock of silver-green ferny leaves is as inviting to the touch as to the eye. This plant has become well-known to gardeners as Silver Mound artemisia.

A Broad-leaved Artemisia

The white-felted leaves of dusty miller (*A. stelleriana*) repeat the whiteness of the East Coast sand dunes they creep over. The plant requires dry, sandy soil and will rot where drainage is poor. The rather straggly stalks of yellow flowers are best cut off in order to preserve the matlike habit of the plant. I like to plant *A. stelleriana* at the front of a border or near the entrance to the garden where its singular whiteness strikes the visitor with most telling effect. ◆

George Taloumis

Silver King artemisia is popular in borders for its gray, fine-cut foliage.

Adapted from *The Years in my Herb Garden* (New York: Macmillan, 1953).

Marjorie J. Dietz

Gottscho-Schleisner

Above: The low-growing artemisia known as Silver Mound borders a planting of lavender. *Right:* Various kinds of artemisia in the author's herb garden. Dusty miller artemisia is shown in the foreground.

There are many low, spreading herbs admirably suited to rocky situations . . .

HERBS IN THE ROCK GARDEN

Dorcas Brigham

ROCK GARDENS were my first love. When I later became interested in herbs, I naturally used some of these plants in rock gardens. These observations are for those gardeners who wish to accommodate suitable plant species in attractive surroundings, rather than for the alpine rock garden purist who defines his garden as a simulation of high mountain meadow.

The Christmas-rose (*Helleborus niger*) opens the spring parade. Its exact date depends on your latitude, amount of snow cover and exposure to sunlight. Pasqueflower (*Pulsatilla vulgaris, syn. Anemone pulsatilla*) soon follows with its furry leaves and stems and large violet bells. The bright golden cups of *Ranunculus ficaria* serve to enliven a slope. The plantation increases over the years by means of its extra vegetative buds as well as by seeds. This is the celandine celebrated by the poet Wordsworth.

Bloodroot (*Sanguinaria canadensis*) wraps its lobed leaves around its 6-inch stem like a cloak on cold mornings, later opening wide its pure white, 2-inch stars. *Viola odorata* scents the air with the sweet fragrance of its small purple flowers. Its pink form, *V. o. rosina,* is equally fragrant and fast spreading.

Where some high shade is available and the soil is rich in humus, hepaticas awake early with fragile lavender, pink or white petals centered with a lace of white stamens. Flowering a bit later in the same shaded area, *Trillium grandiflorum, Mertensia virginica,* and *Brunnera macrophylla* (*syn. Anchusa myosotidiflora*) make an unforgettable picture in white and soft and brighter blues. Mats of *Pulmonaria angustifolia azurea* planted in front of this grouping add a note of rich gentian-blue flowers.

The alliums or decorative onions, which do not smell of onions unless crushed, are a little-appreciated genus of herbs. *Alli-*

Marjorie J. Dietz

Garlic chives (*Allium tuberosum*) is one of the last culinary herbs to flower in the fall—when it does so with abandon. It is best to remove the spent blossoms before seeds are formed as this species reseeds profligately throughout the garden.

Right: The Christmas-rose is one of the first flowers to appear in early spring—or in late winter in some localities. *Below right:* The ivory flowers of *Crocus ochroleucus* are marked with orange in their throats. They appear in the fall.

M. M. Graff

um karataviense is noteworthy for its pink-edged gray leaves, as broad as those of tulips, and for tennis-ball-sized pink-gray flowers on short stout stems. *A. moly* brightens any spot with its mass of gold flowers in June, while *A. flavum minor* contributes a more delicate yellow a bit later. *A. ostrowskianum* has glowing rose-pink flowers. *A. pulchellum* lifts its lacy lavender tassels about a foot high in July and August. *A. senescens glaucum* has gray-green leaves with a slight twist; it bears ashy pink balls in August and September. The nodding onion, *A. cernuum,* has drooping buds but lifts its pink flower head erect. *A. tuberosum* ends the onion season in September with showy white heads on 2-foot stems. The last is the flat-leaved "garlic chives" so popular with herb enthusiasts.

I find winter savory very effective in a rock wall since it bears its white flowers late in the season after other plants are through blooming. *Sempervivum tectorum* and *S. soboliferum* also adjust easily to a wall. *Dianthus plumarius* is very showy here as are the Scotch harebells and *Nepeta* x *faassenii* (*syn. N. mussinii*) and *N. macrantha.*

In late autumn, *Ceratostigma plumba-*

Spotted dead-nettle (*Lamium maculatum*) is a fine choice for a rock garden or wall where its robust growth will not overwhelm more delicate plants.

Marjorie J. Dietz

ginoides, familiar in many gardens as plumbago, drapes a bank with gentian-blue flowers followed by red bracts and handsome bronze foliage. The latest herbs to flower in the rock garden are autumn crocuses and colchicums which seem to spring from the ground only days after planting. Their magentas, lavenders and violet-blues are especially effective in contrast with their somber surroundings.

◆

WORTHY HERBS FOR THE ROCK GARDEN

Achillea tomentosa—Woolly Yarrow
Achillea tomentosa webbiana—Dwarf Yarrow
Acinos arvensis—Basil-thyme
Ajuga genevensis—Geneva bugle-weed
Ajuga reptans—Bugle-weed
Artemisia frigida—Fringed Wormwood
Artemisia schmidtiana 'Nana'—Silvermound Artemisia
Artemisia stelleriana—Beach Wormwood
Asarum canadense—Canadian Wild-ginger
Asarum caudatum—California Wild-ginger
Asarum europeum—European Wild-ginger
Caltha palustris—Marsh-marigold
Campanula rotundifolia—Scotch Harebell
Clintonia borealis—Northern Jetbead
Clintonia umbellata—Southern Jetbead
Coptis trifolia—Goldthread
Cotula coronopifolia—Brass-buttons
Dentaria diphylla—Toothwort
Dicentra eximia—Fringed Bleeding-heart
Galium verum—Yellow Bedstraw
Gaultheria procumbens—Wintergreen
Geranium robertianum—Herb Robert
Goodyera pubescens—Rattlesnake-plantain
Hepatica acutiloba—Sharp-lobed Hepatica
Hepatica americana—Round-lobed Hepatica
Herniaria glabra—Burstwort, Rupture-wort
Hexastylis shuttleworthii (*syn. Asarum shuttleworthii*)—Southern-ginger
Lamium album—White Dead-nettle
Lamium galeobdolon—Archangel Dead-nettle
Lamium maculatum—Spotted Dead-nettle
Lavandula officinalis 'Munstead Dwarf'—Dwarf Lavender
Linaria cymbalaria—Kenilworth-ivy
Linum perenne—Blue Flax
Lysimachia nummularia—Creeping Charlie
Mentha requienii—Corsican Mint
Mitchella repens—Partridge-berry
Myosotis scorpioides semperflorens—Everblooming Forget-me-not
Nepeta macrantha—Siberian Mint
Primula auricula—Auricula
Primula elatior—Oxlip
Primula veris—Cowslip
Primula vulgaris (*acaulis*)—English Primrose
Pyrola elliptica—Shinleaf
Rosmarinus officinalis 'Prostratus'—Dwarf Rosemary
Santolina chamaecyparissus — Lavender-cotton
Satureja montana—Winter Savory
Scilla sibirica—Squill
Sedum acre—Goldmoss Stonecrop
Teucrium chamaedrys—Germander
Teucrium lucidum—Hedge Germander
Thymus species—Thyme
Tiarella cordifolia—Foam-flower

A garden of herbs to visit in Strybing Arboretum . . .

GARDEN OF FRAGRANCE

John E. Bryan

ONE of the warmest descriptions I have read of the Strybing Arboretum's Garden of Fragrance in San Francisco's Golden Gate Park is, "It is a cozy garden—like being in a room full of friends, where light is not needed." This to me sums up what has been achieved in our Garden of Fragrance.

The garden was dedicated on June 10, 1965, and covers just over half an acre. The paths are wide and smoothly paved. On either side of the path are walls of hand-hewn limestone, part of a Spanish monastery bought by William Randolph Hearst as a gift to the city of San Francisco. Lack of funds and loss of records made it impossible to reconstruct the monastery as planned, so the stones were given to the Recreation and Park Department. The weathered, moss-covered stones, some of which bear the hallmark of the mason who shaped them, convey an atmosphere of antiquity.

As with any garden of this scale, a substantial amount of support and planning was necessary to bring it into being. The garden clubs of the whole Bay Area rallied together to raise more than $20,000 to pay for the architect's drawings and actual construction. Height of the walls, width of paths, length of the walk: all these details were studied and considered before final plans were approved.

The entrance to the garden is inviting to all. There is an introductory plaque in Braille for persons who are visually handicapped. Visitors enjoy feeling the plants, and the Arboretum encourages this use. The limestone walls have a very fine tactile quality, as do the plants which grow over the stones. There is a narrow stream in which visitors can dip their fingers to rinse off strong fragrances. Smooth and rough stones and sand, both wet and dry, offer additional textures.

A green alcove is situated at the end of the walk, with a bench opposite. This area attracts many birds which add another

George Taloumis

The gray leaves of lamb's-ears are inviting to touch because of their soft velvet-like texture.

dimension to the garden. A statue of St. Francis by a San Francisco sculptor, the late Clara E. Huntington, graces the alcove.

All of the plants in this garden have some attribute other than visual appeal. There are thymes to squeeze, lavender to pinch, and junipers with distinctively textured foliage to touch. In addition there are scented geraniums and fragrant flowering shrubs such as osmanthus, daphne, and Mexican-orange (*Choisya ternata*). Also included is the strawberry plant for the delicious aroma of its crushed fruit. Lilies and narcissus are a few of the bulbs planted to add seasonal interest to the garden.

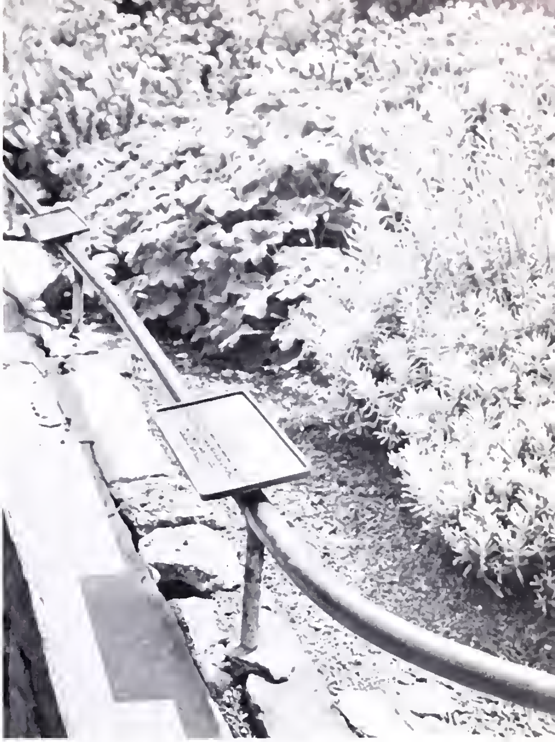
The Braille labels are appreciated by sightless visitors. We have found it essential to have labels in close proximity to the plant they describe. Labels carry more than the scientific and common names in order to attract nonhorticultural visitors. An example: "Basket of Gold (*Alyssum saxatile*), a spreading perennial with fragrant golden flowers, native of Europe." The labels appeal to people of various ages and induce visitors to move ahead to investigate the other exciting plants to be seen, touched, and smelled. This is the purpose of the Garden of Fragrance—perhaps better named the Garden of the Five Senses. ◆

The path that winds through the Strybing Arboretum's Garden of Fragrance. The plants on either side have been chosen for their foliage, aroma and habit.

A SMELL-AND-TOUCH GARDEN

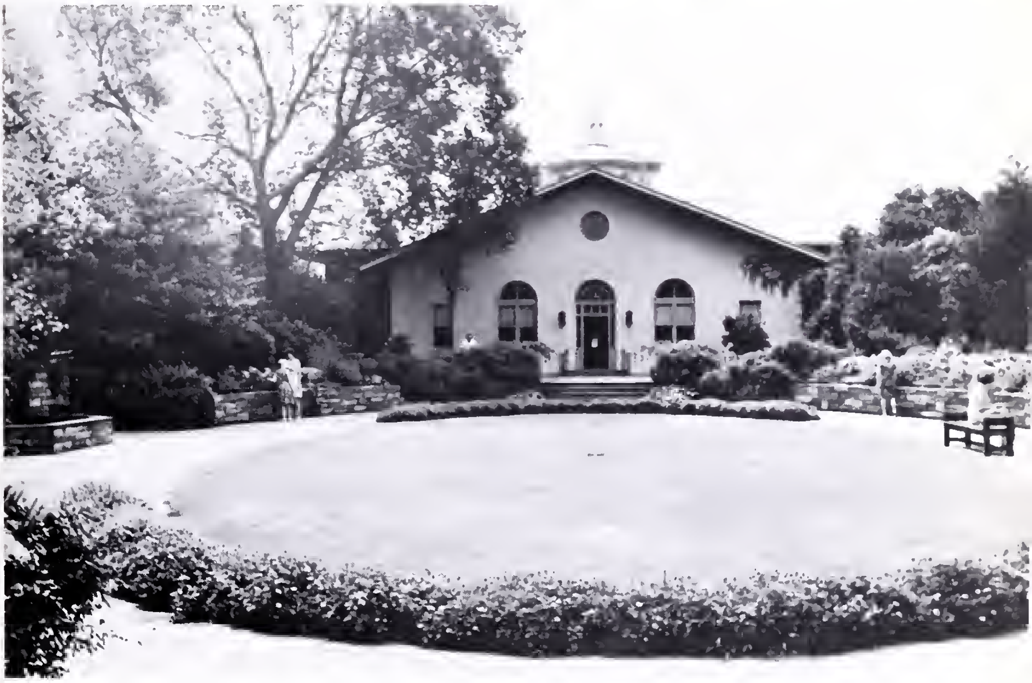
THE Fragrance Garden at the Brooklyn Botanic Garden consists of four raised plant beds which are supported by stone walls with railings. Attached to them are Braille labels giving brief descriptions of each plant. The plants selected fall into four categories—plants with distinctively aromatic foliage, plants of unusual texture, plants with fragrant flowers, and plants of taste—the kitchen herbs. In addition to the annuals and perennials that make up the bulk of the display, certain trees and shrubs have been selected for their fragrant flowers and are planted near the three entrances to the garden.

—*Nancy Shopis*



Bronze Braille signs tell the story of various foliage-scented plants—lavender and peppermint geranium.

George Hull



The oval-shaped Garden of Fragrance, constructed in 1955, was made possible through the generous donations of many friends of the Brooklyn Botanic Garden.

LAVENDER AND THYME

Claude Johnston

Of all the traditional herbs, perhaps lavender is the most familiar. All parts of the plant possess the typical aromatic fragrance which is as pervasive after leaves, stems and flower spikes have been dried. The scent is discernible in early spring from stems and leaves which have been killed after a severe winter, making the removal of such parts a pleasant task.

Planted together in natural harmony, they engender a feeling of well-being and contentment

Eleanor Brown Gambee

"THE THYME is a faithful companion of the Lavender. It lives with it in perfect sympathy and partakes alike of its good and its bad fortune," observed the nineteenth-century French botanist, Jean Gattefossé.

Seeing these two important members of the mint family (*Labiatae*) growing side by side gives validity to such a statement. There could hardly be two more compatible plants, satisfying in color of bloom and foliage, pleasing in fragrance and complementary in habit of growth.

The number of species of thyme ranges from 50 to 100, depending on the botanical authority one chooses to follow for this taxonomically complex group in which one man's species is another man's variety. Essentially, thymes are subshrubs: erect and growing to about 9 inches in the common thyme (*Thymus vulgaris*) or mat-forming in the numerous variants of mother-of-thyme (*T. serpyllum*).

Lavender, in distinction, is always upright. The most widely cultivated species, *Lavandula officinalis* (*syn. L. spica*) usually stays below 2 feet in northern gardens. The cultivar 'Munstead Dwarf' is somewhat lower, and one truly dwarf form, 'Nana,' does not exceed 9 inches. Lavender is frequently planted in herb gardens as a low hedge because of its compact growth, refined foliage and ability to stand clipping.

The long-blooming, delicate flowers of thyme, ranging in color from palest pink to deep purple, and the variety of foliage color—dark green, silver, or variegated yellow—form an ideal base for the taller-growing gray-green lavender with spikes of clear blue or lilac flowers. In each group there is also a form with white flowers.

(*Continued*)

Paul F. Frese

Mother-of-thyme is one of the few ground covers which resists foot traffic. Once introduced, thyme can be expected to seed itself in benign fashion, filling crevices in walls and pavements.

Both plants thrive under full sun in poor, sandy, well-drained soil. If the area is too fertile, there will be a diminution of fragrance.

The pleasing effect of the heady scent of both genera has been recognized over the centuries. Enjoyment of these herbs is enhanced by a little knowledge of their history. *Lavandula* comes from the Latin word *lavare*, to wash. The Romans used lavender water extensively in their baths.

Thyme was once accorded magical powers as a purifying agent. Passing through a smoky fire of dried and green thyme was believed to cure the ailments of country folk and their cattle, to promote fertility and to protect against future ills. In ancient Greece, thyme was the chief ingredient of the altar fire on which a sacrificed lamb or kid was roasted. The fumes of burning thyme purified the offering and made it acceptable to the gods. Later, the priests shared the roast meat with the audience who—in addition to being purified—doubtless enjoyed the enhanced flavor enough to add thyme to their home cooking.

The sixteenth-century herbalist, John Gerard, notes that both lavender and "Time" are good for those who have the falling sickness (epilepsy) "to smell unto."

Dried lavender was once used in clothes closets and chests to keep out moths and other insects. The delicious spicy scent was merely a fringe benefit.

In *A Modern Herbal*, Maude Grieve says that "not only are insects averse to the smell of Lavender, so that oil of Lavender rubbed on the skin will prevent midge and mosquito bites, but it is said on good authority that the lions and tigers in our Zoological gardens are powerfully affected by the scent of Lavender Water and will become docile under its influence."

Of thyme, Mrs. Grieve writes "The herb wherever it grows wild denotes a pure atmosphere, and was thought to enliven the spirits by the fragrance which it diffuses into the air around. The Romans gave Thyme as a sovereign remedy to melancholy persons." That the remedy often called for a decoction of the leaves in wine may have had some bearing on its efficacy in banishing gloomy thoughts.

The affinity of bees for both herbs has been observed from ancient to modern times. The musical droning of bees adds to the delight of seeing and smelling this combination of herbs. ◆

Refreshment every step of the way results when mother-of-thyme is planted at base of steps and in crevices of steps leading to and from terrace area.

Kitchen pot garden: From left to right are basil, salad burnet with fern-like foliage and costmary.

Ideas for growing herbs in pots, tubs or boxes—indoors or out . . .

A KITCHEN GARDEN IN CONTAINERS

Mary Mason Campbell

A KITCHEN GARDEN of herbs and vegetables can be grown in pots, tubs or boxes, indoors or out, winter and summer, in the space of a few feet. The only limitation is the enthusiasm and patience of the gardener and the amount of sunlight (or even artificial light) that can be made available.

Herbs and vegetables grown in containers need plenty of light, water and humidity but must have the sharpest possible drainage. Soil should be rich, as nutrients are quickly exhausted in a confined space. If you have an outdoor garden, you can prepare potting soil by mixing three parts of good loam and compost, one part sand, a little bone meal, and wood ashes or lime. Apartment dwellers can make a satisfactory mixture with packaged potting soil to which is added some bone meal and a quantity of birdcage sand containing ground oystershells to increase lime and aerate the soil. Clay pots are recommended as their porous sides admit air.

Potted or tubbed herbs have the advantage of mobility. They can be moved to the sunny side of a patio to scent the air, or to the outdoor dining terrace for ready use by the cook. Tender perennials such as lemon-verbena, rosemary, and the scented and flowering geraniums, when grown in containers, can be moved in and out of the house without root disturbance. Strawberry jars planted with a variety of herbs make splendid decorative accents to welcome guests at a doorway or to mark the turn of a path. The jar must be frequently turned in order to give all the plants their share of sunlight. If the jar is large and heavy, it should be set on

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Adapted from *Betty Crocker's Kitchen Gardens* (Universal Publishing, Inc., New York, 1971).

Photographs by George Taloumis

a wheeled platform before filling and planting.

Container-grown herbs play a stellar role in the garden picture as they are usually set close to the house where they are on constant view. They call for scrupulous grooming: the removal of spent flowers or dead leaves, and judicious pruning to prevent straggly growth. The snipping of herbs for use in the kitchen serves another purpose—as long shoots are cut back, the plants are kept trim and compact. ◆

Left: A strawberry jar is planted with apple and peppermint geraniums, parsley and rosemary. *Below*: A passageway or entrance is ideal for lemon verbena which fills the air with a cool spicy scent each time its foliage is brushed.

Memories of a farm in Brooklyn

SUMMER ON THE FARM

Elizabeth Remsen Van Brunt

THERE WAS NO ornamental, artistically designed herb garden on the turn-of-the-century farm where we children spent our summers. Located in the Flatlands section of Brooklyn, less than ten miles from Wall Street, it was a genuine working farm. Market wagons were loaded every other day with cauliflowers, cabbages, celery, potatoes and spinach for trips to the city market.

The women of the busy household had little time for pleasure gardening. They grew the necessary herbs for cooking and for medicine: anise, caraway and dill, sage, peppermint, parsley, pennyroyal, calamus root and horseradish. However, roses, a few plants of lavender, rose geraniums and a lemon-verbena were jealously guarded for their fragrance and color.

Some of the herbs were sown in rows at the parsley-bordered ends of the long vegetable rows, just inside the gate nearest the house. Several sage plants made a satisfying beautiful clump of gray-green on either side of the gate, near enough to the rows of plump raspberries so that we could surreptitiously eat our fill when cutting sage in early summer. Hung from the rafters in the hot attic, the sage dried in short order. It was then stored in jars to await pig-killing time in autumn. We children enjoyed rubbing the dry leaves to powder between our palms and adding it to freshly ground black pepper and salt for sausage seasoning.

We were delighted to be sent to the brook in the meadow to pick spearmint when a roast of lamb called for mint sauce. Sometimes we gathered peppermint to brew a hot tea for stomach-ache or indigestion. We made side trips to nearby woodlands for wild pennyroyal to scrub on our bare arms and legs. Mosquitoes were voracious but the pungent smell of pennyroyal deterred them. Freshly dug calamus root (*Acorus calamus*) had an intriguing flavor when nibbled at the moment of its surprisingly white emergence from the dark muck at the marsh's edge, but we preferred it crystallized in slivers as a digestive after Sunday dinner.

A Way with Horse-radish

Horse-radish, escaped from some old garden in the vicinity, grew in the swampy land, but we gathered it only in an extreme emergency. Horse-radish was

Gottscho-Schleisner

M. M. Graff

The pink moss rose 'Mousseux Ancien.'

the accepted prerogative of a familiar and always welcome visitor, Mr. Van Houten, who made part of his livelihood from this plant. He was warmly greeted when he drove into the yard, rickety buggy creaking, slapping the reins over his dapple-gray nag. He would sit interminably on the kitchen steps in his straw hat, black vest, and shirt sleeves, grating horse-radish (undoubtedly dug from our marsh) into a large bowl. At intervals, our cook Maggie would snatch the bowl from his aproned knee so the contents could be bottled with vinegar, salt and a mite of sugar before it turned dark. The bottles were then stored in the preserve cupboard in the cold cellar.

Mr. Van Houten let us chew on the bits of horse-radish that were too small to grate without skinning his fingers. It was powerful stuff, bringing tears to the eyes and clearing sinuses.

Tansy grew luxuriantly along the pasture fence. In summer, bunches of it were hung from the lamp brackets in the kitchen to discourage flies. I believe it was after reading *The Spectator Papers* that a 'tansy' was attempted on an Easter Sunday. The adaptation, a vanilla soufflé flavored with minced tansy, was eagerly anticipated. All brown and puffy and accompanied by thick sweetened cream, it was tasted with great curiosity. The tansy added an odd taste—to our unsophisticated palates.

Caraway was grown in a row in the vegetable garden for the caraway cakes traditionally served by our New Netherland forebears to New Year's Day callers. Perhaps the visitors were offered something more potent than the dandelion-blossom wine or the apple cider we were allowed. The tradition of immortality associated with caraway, a legend probably picked up in China by Dutch seamen centuries before, was a heady accompaniment to the thickish cookies.

There were a few colorful cabbage and moss roses along the fence. Clumps of lavender grew nearby, underplanted with Johnny-jump-ups and, in spring, orange, purple and white Dutch crocuses. There was also a rare York and Lancaster rose and a 'Variegata de Bologna,' strangely striped, on a post. The petals of all these old roses imparted an elusive, dreamy fragrance to the whole house while they were drying.

A small package of powdered orris root was kept on the top shelf of the medicine cupboard, forbidden to our touch until it was taken down to be blended with rose petals, lavender, lemon-verbena, rose geranium leaves and several spices for the great bowl of potpourri that gave the rooms fragrance all winter. If it had been known that orris root (*Iris germanica* var. *florentina*) could be grown at home, my grandmother might have saved her meager household allowance that expense, for she ordered it from a distant pharmacy.

The purchase of orris root was one of the few indulgences of an otherwise self-sufficient household—self-sufficient by inclination as well as by necessity. In a time when there was no supermarket or drugstore at the corner, it was a case of growing and gathering your own food and medicine or doing without. Prudent management and the bounty of surrounding fields and wetlands kept my grandmother's larder and cupboards well supplied. Our expeditions to gather herbs for the family's use are one of the happiest memories of childhood and without a doubt laid the foundation for my lifelong interest in herbs. ◆

Pleasant discoveries await those who explore herb gardens in the winter season

HERBS FOR A WINTER GARDEN

Helen Tilton Batchelder

THE REWARDS of herb gardening are not limited to summer. The well-designed herb garden, outlined by a light snow, reveals subtle charms of form and color not apparent in the peak of summer.

After the heat and harvest are over, perennial herbs prepare for winter: their growth, close to the ground, becomes firm and stocky. Color deepens as nights chill. Succulence turns to substance. Orange flames of saffron announce that autumn is here.

As winter approaches, the garnet of thymes, maroon of Madonna lily leaves, and purple-gray of lavenders give one a new appreciation of herbal color charts. Ruddy rosettes of winter savory, crimson-tipped houseleeks, red and henna rose hips and black ivy berries enliven the dark days of November. Only chartreuse wallpepper (*Sedum acre*), emerald burnet and apple-green chervil resist the change in temperature. Hedges of teucrium, hyssop and santolina—last clipped in August—show up as never before against paved paths of brick or stone. Gray pebbled leaves of sage droop under the frost, but lavender stands erect and sturdy. Small hungry birds gather the last clinging seeds from rangy stalks of skirret and fennel.

Soon the first snowflakes leave a white shawl on the boxwood hedges. The next storm, a little heavier, turns the patterned herb garden into a valentine.

Rarely does one have a greater garden pleasure than going out on a crisp December day to cut fragrant herbs for the Christmas crèche or for herb wreaths, emblems of friendliness whose symbolism reaches back through the ages.

In Rhode Island, January is an uncertain month, freezing and thawing by turns. One wonders if the light mulch of compost, coca shells or marsh hay in the herb garden will be enough to tide over those Mediterranean natives until spring, and hopes that the European-ginger is snug under Christmas tree boughs.

Then, on a morning in February, one sees through the window that the warm sun has coaxed out the yellow streamers of Chinese witch-hazel. In the far distance the silver catkins of rosemary willow sway and glisten. A quick trip around the garden reveals adonis's yellowing buds, fuzzy heads of coltsfoot and, in the coldframe, half-open blossoms of mottled and plum-colored Lenten-roses. Spring is on the way! ◆

M. M. Graff

Winter is waning when the yellow flowers of adonis first appear. The Amur adonis (*Adonis amurensis*) often flowers in mid-March in the New York City area.

BOOKS FOR FURTHER READING

Hester Mettler Crawford

A GREAT MANY books have been written about the magic world of herbs. It is impossible here to give but a sampling of a few personal favorites—books that have been especially helpful to me over the years and which I would not hesitate to recommend to anyone interested in this subject.

Herbs and the Earth by Henry Beston. Doubleday, 1940.

A book to turn to in times of joy and sorrow. The dignity, peace and timeliness of the ancient herbs—and of the very earth itself—are here to guide you. One of my very favorite books. It is out of print but is available in most horticultural libraries.

Herbs, Their Culture and Uses by Rosetta E. Clarkson. Macmillan Co., 1966. $4.95.

An herb classic that covers garden design; the growing, harvesting and processing of herbs; and their use in cooking, for dyes and for fragrance. There is a valuable descriptive list of 101 herbs.

Herbs for Every Garden by Gertrude B. Foster. E. P. Dutton & Co., 1966. $4.95.

A readable, helpful guide on how to grow and use herbs, based on the author's wide and careful research.

The Years in My Herb Garden by Helen M. Fox. Macmillan Co., 1953.

A search for this out-of-print book is worth the effort, for it is the scholarly result of 30 years of horticultural study and herb growing. A wealth of information about herbal plants, trees and shrubs, and how to use them in the garden. Currently in print in a soft-cover edition: Mrs. Fox's *Gardening with Herbs for Flavor and Fragrance*. Dover Publications; $2.50.

A Modern Herbal by Maude Grieve. Two volumes, edited by C. F. Leyel. Hafner Publishing Co., $29.50; new index $5.00 additional.

This reprint of a 1931 book is in fact an encyclopedia of culinary, cosmetic and medicinal properties of herbs, herbal trees and related plants with information on their economic uses, cultivation and botany.

Early American Gardens—for Meate or Medicine by Ann Leighton. Houghton, Mifflin Co., 1970. $10.00.

A carefully researched account of seventeenth-century American gardens and the gardeners who made them, with plant lists and quotations from old books and herbals.

A Book of Herbs by Dawn Macleod. Transatlantic Arts, 565 5th Avenue, N.Y., N.Y. 10017. $10.00.

A recent most comprehensive book from England on growing herbs, with many recipes for their use.

Book of Herb Lore by Lady Rosalind Northcote. Dover Publications, soft cover. $2.50.

This reprint of a 1912 edition is a beautifully written and most useful book. An oft-quoted book for many years.

A Garden of Herbs by Eleanour Sinclair Rohde. Dover Publications, soft cover. $2.50.

Practical directions for cultivating an herb garden. Ancient recipes and charming quotations from old herbals. The same author's *Herbs and Herb Gardening*, originally published in London by The Medici Society in 1936, is a beautiful and inspiring book on colorful herbs in the flower garden, and it also has advice on the making of an herb garden. Currently out of print.

Herb Gardening in Five Seasons by Adelma Grenier Simmons. Hawthorn Books, 1971, $7.95.

A practical, delightful outcome of the author's study and work with herbs. Modern in concept and warm in feeling. Her book *Herbs to Grow Indoors* (Hawthorn, 1969, $5.95) is the first one written about the indoor culture of herbs.

Herbs, How to Grow Them and How to Use Them by Helen Noyes Webster. Charles T. Branford Co., 6th printing, 1959. $4.95.

Ancient and modern uses of herbs in medicine, perfumery, sentiment and cooking. A check list of herbs for modern gardens with directions for growing and using. ◆

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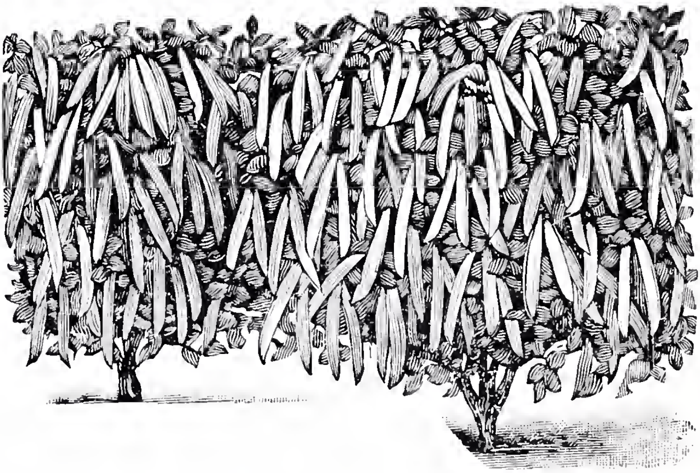

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CONTENTS

Home Garden Harvest—Beets and Peas ... *Roche* Cover
Succession Plantings: Corn and Beans ... *Roche* 2
Letter from the Brooklyn Botanic Garden ... 3
Why a Vegetable Garden? ... *Isabel Zucker* 4
A Place for Your Vegetable Garden ... *Robert F. Fletcher* 5
Small Garden Plan ... 7
The Vegetable Garden and Its Soil ... *Donald N. Maynard* 9
Planting the Vegetable Garden ... *Norman F. Oebker* 12
Selecting Vegetable Varieties for the Home Garden ... *W. Ray Hastings* 18
Mini-vegetables for Mini-gardens ... *Joseph M. Lent* 21
Garden Tools and Equipment ... *Edward L. Palmer* 23
Storage of Vegetables ... *Joseph M. Lent* 28
Sweet Corn for the Home Garden ... *Albert A. Banadyga* 29
Greens, Lettuce and Other Salad Vegetables ... *J. Lee Taylor* 31
Tomato, Eggplant and Pepper ... *B. L. Pollack* 36
Gardeners Have Many Ways with Tomatoes ... *Marjorie J. Dietz* 41
Easy Potato Patch ... 42
Pelleted or Coated Seed ... *Joseph M. Lent* 44
Summer Care of the Vegetable Garden ... *Orrin Turnquist* 45
Large Garden Plan ... 48
Ornamental Vegetables ... *Joseph M. Lent* 50
Vegetables in a Pod ... *Leslie Hafen and Donna Hoffman* 53
Vegetables with Edible Roots ... *William M. Brooks* 56
Asparagus and Rhubarb ... *W. B. Johnson* 60
Unusual Vegetables ... *H. N. Metcalf* 64
Cabbage, Broccoli and Their Relatives ... *P. A. Minges* 71
Squash and Its Relatives ... *Cecil L. Thomson* 75
Onions and Related Vegetables ... *William Sanok* 79
Control of Insect Pests ... *Milton S. Savos* 82
Disease Control in the Home Vegetable Garden ... *D. B. Schroeder* 86
The Children's Vegetable Garden in Brooklyn ... *Frances M. Miner* 89
Index to Vegetables ... Inside Back Cover

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Paul Frese

Roche

SUCCESSION PLANTING: *Above*: Three harvests of corn will be taken from this garden because the seeds were planted at varying intervals. *Left*: Three rows of bush beans have been planted at different times so the harvest will be spread over a longer period. There is also a row of pole beans which tend to bear over a longer period than do most bush bean varieties.

LETTER FROM THE BROOKLYN BOTANIC GARDEN

One of the pleasant developments in American horticulture in recent years has been the reemergence of vegetable growing in the home garden. More and more people, particularly young ones, seem to find satisfaction in turning to the earth and, upon a due amount of labor, reaping a most practical harvest. In contrast to much of the world around us, there is very little nonsense in the vegetable garden, and the quiet thoughts that do occur while one is cultivating the backyard estate are mind-expanding in the best sense of the term. Or, at least, as Thomas Jefferson observed in his *Notes on the State of Virginia* (1787): "Corruption of morals in the mass of cultivators is a phenomenon of which no age nor nation has furnished an example."

True, there are occasional feelings of aggression in the vegetable garden, but they are directed toward squash borers and the like. And, if there is anguish, it may be because one suffers from the American fondness for vine-ripened tomatoes—and it hasn't been the Year of the Tomato. Mostly, though, there are pleasures, including ones that exceed the material bounty.

The purpose of this Handbook is to provide you with the essential information on how to succeed in the vegetable garden with a minimum of frustration. Let us now thank for their timely efforts Guest Editor Joseph M. Lent and the twenty-one other Contributors who made this compendium possible. At the same time, let us note that most of our Contributors represent state agricultural extension agencies around the country. The routine everyday work that such men perform in advising the nation's gardeners on a regional and local level is one of the most important public services rendered in American horticulture today.

Perhaps a word about questions people frequently ask our Instructors at the Botanic Garden. One of the most common is: "Is it all right to save the seeds from my vegetable plants and sow them next year?" Generally not; better to obtain new seeds directly from a dealer. Also, while the seeds of some vegetables are surprisingly durable, it will often save disappointment to discard last year's unused seed packet and start with a fresh supply in the new season. Vegetable seeds are inexpensive. They are, in fact, one of the best values to be had in these days of ever-rising prices.

Frances Miner, who has directed the Children's Vegetable Garden here for many years, is often asked by parents what plant is best for a child to grow from seed in a windowsill garden. She recommends string beans, which vegetable breeders these days prefer to call snap beans since the "string" has been bred out. Her reasons: the seeds are large enough for a child to handle; they grow indoors at any time of year, even in winter; and, given sun, they will produce edible results quickly, usually in about eight weeks. Again, obtain seed from a dealer, not from the fresh vegetable section of a supermarket.

Frances Miner would also emphasize Dr. Palmer's remarks about tools and their care (see page 23). Some of the hoes and rakes used in the Children's Garden today date from 1917. They were made of good iron to begin with, and the youngsters wipe them clean after each use in rags lightly treated with machine oil. In gardening, as in many other things in life, it costs little to buy the best if you are thinking in terms of years and not of a season.

All of our Contributors join us in hoping that this Handbook will help you to a rewarding harvest in your vegetable garden.

Frederick McGourty, Jr.

Editor

The young love to grow vegetables. Make a vegetable garden a family affair

National Garden Bureau

WHY A VEGETABLE GARDEN?

Isabel Zucker

NOT too many years ago the reason was the obvious one of necessity: every family had to grow its own vegetables to survive. While today this situation no longer exists, more and more families are growing their own vegetables, as the recent, sudden rise in sales of their seeds attests.

Why do people, many of them first-time gardeners, have a vegetable garden? First, they are responding to the human need to handle the soil. There seems to be something about firming seeds to soil or soil to plants that satisfies a deep longing.

Second, more leisure time allows them to do as they please. By growing vegetables, people feel that they are making constructive use of their lives rather than idling days away.

Third, no store-bought vegetables ever match the taste of those home grown. They are delicious. The classic example of the contrast is sweet corn, which loses sugar rapidly from the moment of picking. Only the home gardener can have the water boiling before he picks the corn and, five minutes later, taste its full flavor.

Another reason, perhaps not thought of when a vegetable garden is planned, is that spending time outdoors is both beneficial to one's physical well-being and calming to the nerves. Tending a vegetable garden can erase a day's tensions and frustrations.

Still another reason is that most children love to grow vegetables and then eat their own produce. With parents helping, the garden becomes a family affair. There is no generation gap in a garden.

The sixth reason for growing your own vegetables is that a garden small enough so it can be kept up in a reasonable time each week, planted with only the crops enjoyed by the family, can save money.

But all of these reasons, which can logically be thought of while the vegetable garden is only a gleam in the gardener's eye, pale before the one that appears later: the feeling of utter satisfaction and triumph felt by the gardener when the first harvest is gathered and enjoyed at the table. This thrill, fortunately, is repeated with each successive harvest. ◆

For the optimum in harvest and
quality from your garden,
give careful consideration to its location

A PLACE FOR YOUR VEGETABLE GARDEN

Robert F. Fletcher

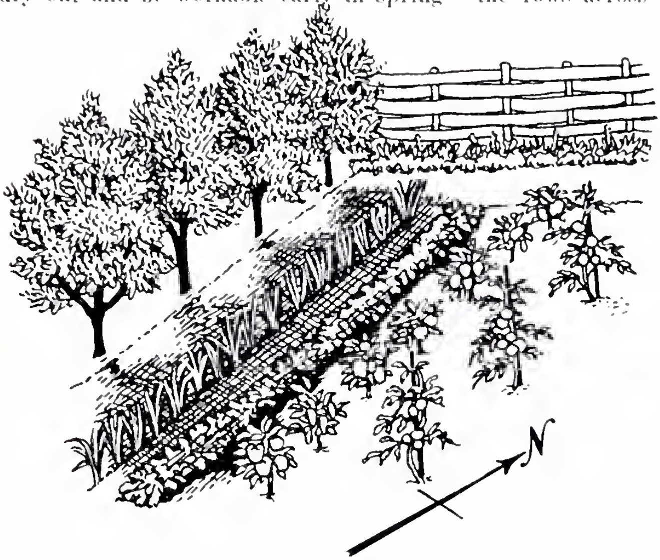
THE vegetable garden on a small property is apt to be relegated to any piece of land not needed for lawn, flower borders, play areas or outdoor dining. The soil is often poor and, for successful vegetable growing, should be modified according to suggestions given in the article beginning on page 9.

If you are fortunate enough to have a choice of sites, here are some guides to selecting the most favorable.

The ideal location for a vegetable garden is on a gentle slope. The pitch should be just enough to keep surface water from standing, without being so steep that it invites erosion in heavy rainstorms. Soil on a south-facing slope will dry out and be workable early in spring but may need extra water in summer.

A slope also provides good air drainage, delaying the action of killing frost. Cold air flows down a slope and gathers in frost pockets at the base. Tomato plants at the top of a hill are often spared for several weeks after those at the bottom have been killed. A current of air also promotes quick drying of foliage after a rain or heavy dew, thus preventing the onset of various diseases whose spores require a wet surface on which to germinate.

When possible, rows should be laid out in a north-south direction so that both sides of the plants receive direct sunlight. However, on a slope it is essential to run the rows across the hillside, not up and



If shade creeps into a portion of the vegetable garden during the day, reserve that area for leaf and root vegetables. Keep fruiting plants, such as beans and squash, at the sunny end.

Eva Melady

down, to increase absorption of water and check erosion.

Problems of Drainage

A low area with poor drainage is unsuitable for growing vegetables, as seeds and roots will rot in the ground. Agricultural tile can be laid if there is a lower place into which water can drain, but in a small garden, this is unlikely. Where drainage is adequate but the soil excessively heavy and water-retentive, additions of sand and organic matter will help lighten and aerate the soil. Conversely, very sandy soil can have its water-holding capacity increased by the addition of organic matter.

The Question of Shade

Avoid planting vegetables in the shade of buildings, trees or tall shrubs. Some leafy vegetables, especially lettuce, will tolerate partial shade, but fruiting plants, such as squash and beans, need full sunshine. In addition to casting undesired shade, trees send their roots into the fertile garden soil and absorb nutrients and water that should be reserved for the vegetable plants. Tall-growing plants, such as corn, pole beans and Jerusalem artichokes, should be located on the north or west side of the plot so their shade will not fall on lower-growing plants.

Finally, if you can, locate your vegetable garden fairly near the house and toolshed. Little jobs of weeding and the more pleasant task of harvesting vegetables at their peak are less apt to be overlooked when the garden is in plain view.

Size of the Garden

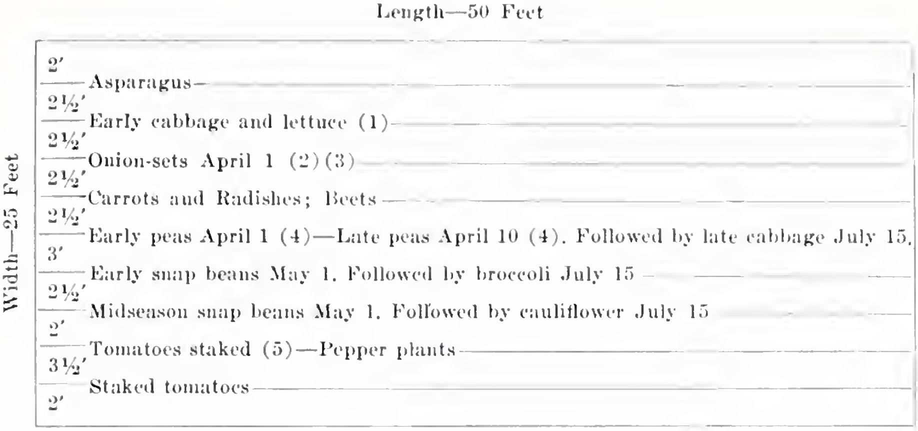
The size of your vegetable garden is likely to be dictated by the dimensions of your property. Beyond that, it is well for beginners to start with a small plot. When experience brings both confidence and enthusiasm, then is the time to make the garden larger. It is far better to have too few vegetables for the table than to undertake such a formidable project that caring for it becomes a burden and the harvest is spoiled for lack of maintenance. The number of persons in the family is a determining factor. Also, the size may be gauged by whether you intend to grow vegetables only for immediate eating or whether you plan to freeze some of the produce.

If you are concerned solely with growing vegetables for money-saving nourishment, then it is wise to choose vegetables of the greatest nutritional value in proportion to the space they occupy. Such vegetables include onions, carrots, beets, cabbage, broccoli, cauliflower, spinach, snap beans, tomatoes, potatoes, winter squash and turnips. However, most home gardeners today are more concerned with a vegetable's fine flavor and freshness, so a larger space may be devoted to sweet corn, greens, and salad crops than to winter squash, potatoes or sweet potatoes.

Another consideration in determining the garden's dimensions is the ultimate size of the vegetable and its edible parts. Cabbage seedlings grow into large heads, and while a small family may consume the first head with pleasure, the prospect of eating the rest of the row of cabbage may be boring.

Succession Planting and Inter-cropping

When garden space is given to a crop of sweet corn, which requires a fair amount of land, this can be balanced to some extent by companion and succession planting. Companion cropping or inter-cropping is the growing of rapidly maturing crops in the same row or between rows of later ripening crops. For example, radish seed may be mixed with beet, carrot, onion, parsnip or salsify seed and sown in the same row. Pulling the radishes acts as a first thinning for the other crops. Rows of onion sets for green onions can be planted between rows of cabbage, the onions being pulled before the cabbages need the space. Similarly, early vegetables, such as peas, radishes, spinach or lettuce, can be planted between rows where


Length—50 Feet
Width—25 Feet
2′
Asparagus
2½′
Early cabbage and lettuce (1)
2½′
Onion-sets April 1 (2)(3)
2½′
Carrots and Radishes; Beets
2½′
Early peas April 1 (4)—Late peas April 10 (4). Followed by late cabbage July 15.
3′
Early snap beans May 1. Followed by broccoli July 15
2½′
Midseason snap beans May 1. Followed by cauliflower July 15
2′
Tomatoes staked (5)—Pepper plants
3½′
Staked tomatoes
2′

(1) Intercrop lettuce plants between cabbage.
(2) Set onions thickly. Thin out when large enough to eat.
(3) Dates are for central Pennsylvania.
(4) Peas sown in double rows 6 inches apart.
(5) Intercrop early spinach, radishes, and leaf lettuce between rows of staked tomatoes.

SMALL GARDEN PLAN. This 25- by 50-foot garden should produce most of the vegetables, with the exception of potatoes and sweet corn, needed for two persons, including canning and freezing requirements. Corn can be included if one row of tomatoes and the row of late green beans are eliminated. A garden this size will require about one-half hour's work a day to achieve maximum production.

tomatoes, peppers or corn are to be grown.

Succession cropping involves planting one crop after another on the same ground in the same season. For example, beans are planted after peas are harvested. Early peas or beans can be followed by late cabbage, while early corn or potatoes can give way to fall turnips or spinach. Obviously such intensive use of the soil will call for extra fertilizer to make up for the depletion of nutrients.

Making a Plan

Careful planning and foresight are needed to make the most of limited space. A detailed garden plan should be drawn to scale, showing the size of the plot, the spacing of rows for each vegetable, the time to plant, and succession or companion crops if these are to be employed. As stated earlier, tall plants should be located on the north or west side of the garden where their shade will do no harm. For convenience and protection, perennial plants such as asparagus, rhubarb, berries and hardy herbs should be grown along one fence where they will not be disturbed by spading or rototilling. Early and quick-maturing vegetables should be grouped together so that after harvesting, the space may be used for later plantings. ♦

Plenty of space?
See page 48 for a
plan for a large
vegetable garden.

Marjorie J. Dietz

A cheap source of humus is a cover crop, such as this winter rye which is being spaded into the soil in spring. The seed is sown in fall at rate of 3 lbs. per 1000 sq. ft.

Helen S. Witty

Many home gardeners do their own soil testing. Others use outside services.

Peat moss is a widely available source of humus for home vegetable gardens.

Most gardeners must be content with less than ideal conditions, but the means are available for improvement

THE VEGETABLE GARDEN AND ITS SOIL

Donald N. Maynard

THE properties of soils which influence the growth of plants vary greatly from one geographical area to another, and even within the limits of an individual property. Fortunately, plants can tolerate a wide range of conditions. When these are markedly unfavorable, soils can be improved by good management.

Organic Matter

The addition of organic matter is perhaps the most beneficial treatment for substandard soils, being equally effective on heavy clay and lean, sandy soils. The fine, tightly compacted soil particles of stiff clay soil are separated, making the texture more granular, improving drainage and providing better aeration. In contrast, dry sandy soil is made more retentive of water and nutrients when organic matter is added. In addition to changing the physical condition of soils, organic material increases the activity of microorganisms.

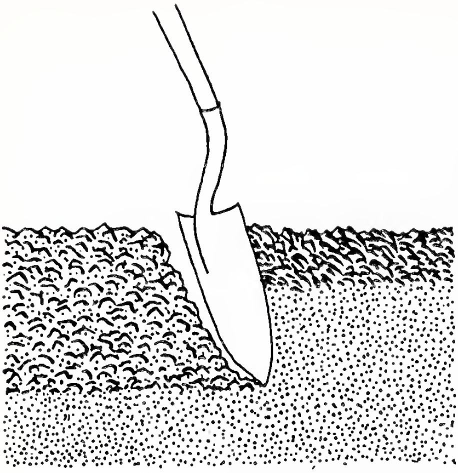
Well-rotted manure, peat moss, lawn clippings, pine needles, deciduous leaves, and many commercial waste products such as sawdust and ground corncobs, generally available at little or no cost, are valuable sources of organic material. Previous composting speeds their decomposition and makes their chemical components more readily available to plants. Organic material should be thoroughly incorporated into the soil by deep digging or rototilling. Additions may be made in spring prior to soil preparation and again in the autumn when garden refuse and the summer's organic mulches may be turned under after harvesting is completed.

Soil Reaction

Soil reaction refers to the relative acidity or alkalinity of the soil as measured by the pH scale. Soils with a pH of 7 are neutral. Below 7, soils are acid, those above 7 are alkaline or basic. Vegetables grow poorly in soil that is very acid (below pH 5) or very alkaline (above pH 8).

In areas of high rainfall, such as the eastern United States, soils are generally acid. In the arid western states, soils are usually neutral or alkaline. Local exceptions to the generalities do occur, however. Soil testing service is available from many garden supply centers, county agricultural offices and state universities. Before investing time and effort in planting a new garden, it is prudent to spend a a few dollars on soil tests. Certain crops, notably beets and spinach, have an extremely narrow range of tolerance. If these do poorly in neighboring gardens, you should suspect an inappropriate pH and get tests with recommendations for modifying the soil before you plant.

There is some variation among different kinds of vegetables in their response to soil reaction. As a rule of thumb, most will grow satisfactorily between pH 5.8 and 7.4. However, performance at the lower end of this range will likely improve with an application of agricultural limestone at the rate of 5 pounds per 100 square feet. The limestone should be spread evenly over the surface and dug or rototilled into the soil. Applications of limestone will probably have to be repeated in acid soil regions every two or



One to 2 inches of organic mulch can be turned under yearly to maintain humus level and tilth of the soil.

three years. Where needed, limestone is the most effective and inexpensive aid to soil improvement available to gardeners.

Lime and Clay Soil

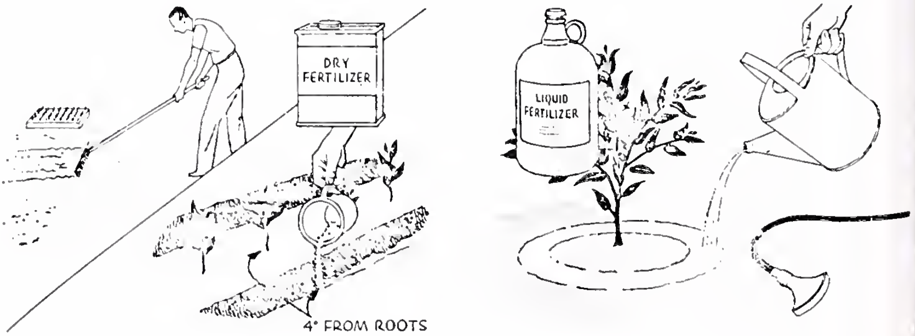
In addition to its primary purpose, that is, the reduction of acidity, the application of limestone has other favorable effects, such as the opening up of clay soil. The combined action of limestone and organic matter will improve the physical characteristics of these soils and make them noticeably easier to work.

As soil acidity is reduced, the soil reserves of certain necessary elements, especially phosphorus, are made more available to plants. Similarly, certain elements such as aluminum, which may be harmful to plants when present in large amounts, are rendered less available with applications of limestone. The practical benefits of adequate use of limestone on acid soils are well known to experienced gardeners and quickly appreciated by beginners.

Fertilizers

Soil must supply plants with a baker's dozen of different chemicals. These must be available when needed, in proper amounts and balance to promote luxuriant growth of vegetables. In most cases the soil itself, or the organic matter that has been added, will supply sufficient quantities of trace elements. These micronutrients include iron, boron, manganese, zinc, copper, molybdenum and chlorine. Sulfur, though required in larger amounts, is usually present in sufficient quantity. Calcium and magnesium are derived from soil minerals or from limestone application.

Unfortunately, the requirement of plants for certain elements sometimes exceeds the ability of the soil to supply them. This is particularly true for nitrogen, phosphorus and potassium, the major plant nutrients. These three chemical elements are often combined and sold as a



METHODS OF FERTILIZING. Fertilizer can be spread over soil before planting seeds or seedlings and raked into soil. Dry fertilizer can be applied along rows of plants. Liquid fertilizer can be applied to soil or foliage. Follow directions on container.

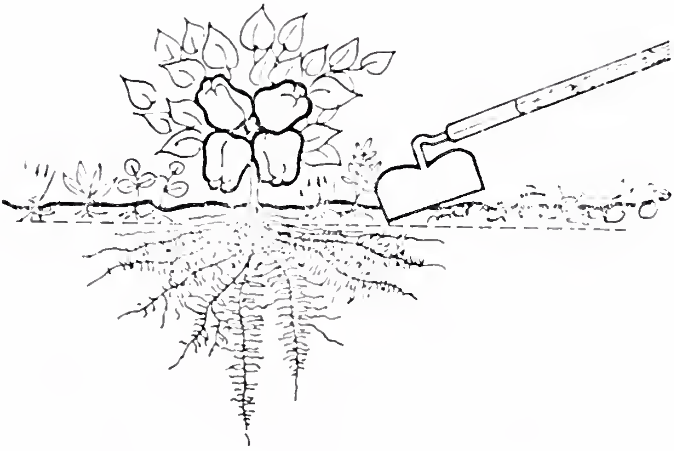
so-called complete fertilizer. The relative composition of a complete fertilizer is designated by a combination of three numbers, for example 5-10-5, indicating the percentages of nitrogen (N), phosphate (P_2O_5) and potash (K_2O) in that order. In some areas, the soil may supply one or more of these elements in sufficient amounts, or be exceptionally deficient in another. Special formulations are available to satisfy such local conditions.

The amount of fertilizer to apply in a particular case depends upon the natural fertility of the soil, the amount of organic material present or applied, and the type of fertilizer used. Under conditions of low soil fertility, 5 pounds of a 5-10-5 fertilizer per 100 square feet should be adequate. This amount can be reduced to 2 or 3 pounds per 100 square feet when the soil is in a higher state of fertility or where organic matter is abundant. The fertilizer should be spread evenly—a lawn-type spreader is ideal—and raked or rototilled into the soil before planting.

For continuous plant growth, it is necessary to have a steady supply of plant nutrients, especially nitrogen. It may be desirable to supplement the fertilizer applied before planting with an additional application during the course of the growing season. The fertilizer (½ pound per 25 feet of row) should be applied on either side of the row beyond the spread of the leaves. (Such methods of applying fertilizer are called sidedressing.) Fertilizer can burn plant leaves and should be hosed off if any accidentally lodges on the foliage. Several applications may be necessary where soils are light or rainfall is above normal. The fertilizer may be cultivated or watered into the soil for more rapid results.

In many home vegetable gardens, the addition of ample amounts of organic matter, the use of a complete fertilizer to supplement the nutrients in the soil, and the addition of limestone in acid soil are all that is needed to adjust fertility.

Frequent shallow cultivation with a hoe, hand cultivator or rototiller are beneficial in many ways. Control of weeds is the first objective, as weeds deplete the soil of water and nutrients needed by the vegetables. A light cultivation also keeps the soil surface open for improved aeration and to retain and absorb rainfall. Wet soils should not be cultivated as clods will sometimes form and the weeds may recover. One final but important note: when working close to vegetable rows, scrape weeds off close to the surface as deep hoeing may injure the roots of vegetable plants. ◆



Practice shallow cultivation, barely scraping the soil, to prevent root damage.

Whether you are growing vegetables in a large backyard garden or just on or off the terrace . . .

PLANTING THE VEGETABLE GARDEN

Norman F. Oebker

A PROPERLY prepared site for the vegetable garden makes planting a pleasure and will bring rewards later in the season when the produce ripens. As soon as the ground can be worked, preferably at least two to three weeks before planting, apply manure, compost or other organic material (see page 9) and work it into the soil to a depth of 8 inches or more.

Fertilizer should be applied before planting. Manure will provide part of the nutrients needed by the plants but more is usually needed. Apply fertilizers according to soil test, local recommendations or past experience. A general recommendation for an average situation is 2-3 pounds of 5-10-10 per 100 square feet. In some western states where the level of potash is high, 1-2 pounds of 16-20-0 will be adequate. Spread the fertilizer over the garden area and rototill it into the top 4 inches of soil. Lime or sulfur can be added at this time if a soil test indicates the need.

In areas where water is applied in furrows and salt accumulation is a problem, raised beds (3-6 inches high and 18-24 inches wide) are used. Rows are located at either or both sides of the top of the bed to avoid the salt concentration in the center.

When to Plant

When you draw up your garden plan, you should include planting and replanting dates for the whole season. The first planting will depend on the last killing frost for your area and on the hardiness of the vegetable. (See Table I.) In general, the hardy vegetables do best in cool weather while the tender sorts thrive on heat.

Seeds or Seedlings

The choice between seeds and started plants depends on the length of the growing season in your area and on the nature of the vegetable. Some vegetables yield a harvest sooner with transplants, but some plants do not transplant easily. Beans, beets, carrots, cucumbers, lettuce, muskmelons, peas, pumpkins, radishes, spinach, squash, sweet corn and watermelons are usually planted from seed in the garden where they are to stand. Broccoli, cabbage, cauliflower, eggplant, peppers, sweet potatoes and tomatoes are usually started in a greenhouse or hotbed and later moved to the open garden. Sometimes, muskmelons, watermelons, cucumbers and squash are transplanted but care is needed to prevent root disturbance. (Sowing the seed in Jiffy pellets or other forms of fiber pots, which are set in the soil after the seedlings have developed, prevents root disturbance.)

Select transplants that are healthy, stocky, medium sized, free from disease or insects, and with good roots. Avoid yellow, spindly or oversized plants and those with spotted foliage, brown lesions on the stems or knots on the roots. Buy plants in containers (fiber pots, bands, or flats) so that root systems are intact and suffer a minimum of disturbance.

How to Sow Seed

Seed sowing is easy but the beginner should heed a few basic pointers. Use fresh seed from a reliable source. Old seed may not germinate well. Mark out

(*Continued on page* 16)

TABLE I PLANTING CHART

Vegetable	Hardiness[a]	Amount for 100 ft. of row	Time required to grow plants from seed before setting in field (weeks)	Spacing in row		Distance between rows (inches)	Planting depth (inches)
				Seed to sow per foot	*Distance between plants when thinned or transplanted (inches)*		
Asparagus	Hardy	75-100 plants	—	—	12-18	36-60	6-8
Beans, bush, lima	Very tender	½ pound	—	3-4	Do not thin	18-30	1-2
Beans, bush, snap	Tender	¾ pound	—	8	Do not thin	18-24	1-2
Beets	Half-hardy	1 ounce	—	10	2-4	12-18	½-1
Broccoli	Half-hardy	50-75 plants or 1 packet seed	4-6	—	18-24	30-36	(b)
Cabbage	Half-hardy	75-100 plants or 1 packet seed	4-6	—	9-18	18-30	(b)
Carrots	Half-hardy	¼ ounce	—	15-20	1-3	12-18	½
Cauliflower	Half-hardy	50-75 plants or 1 packet seed	4-6	—	18-24	24-36	(b)
Celery	Half-hardy	200 plants	10-12	—	6-8	24-36	(b)
Chard	Half-hardy	1 ounce	—	8-10	4-8	18-24	½-1
Chinese cabbage	Half-hardy	1 packet	—	4-6	12-15	24	½
Cucumbers	Very tender	½ ounce	4	3 in row 4-5 per hill	12, single plants 36, hills (3 plants per hill)	48-72	1
Eggplant	Very tender	50-75 plants	8-10	—	18-24	30-36	(b)
Endive	Half-hardy	1 packet	—	4-6	9-12	18-24	½
Garlic, from cloves	Hardy	400 cloves	—	—	3	12-18	1½
Horseradish, from sets	Hardy	50 sets	—	—	24	30-36	2
Kale	Hardy	¼ ounce	—	4-6	8-12	18-24	½
Kohlrabi	Hardy	¼ ounce	—	6-8	3-6	18-24	½
Leeks	Hardy	¼ ounce	—	10-15	2-4	12-18	½
Lettuce, head	Half-hardy	100 plants	4-6	4-8	12-15	18-24	½[c]
Lettuce, leaf	Half-hardy	1 packet	—	10	2-4	12-18	½

TABLE I PLANTING CHART (*continued*)

Vegetable	*Hardiness*[a]	*Amount for 100 ft. of row*	*Time required to grow plants from seed before setting in field (weeks)*	*Spacing in row*		*Distance between rows (inches)*	*Planting depth (inches)*
				Seed to sow per foot	*Distance between plants when thinned or transplanted (inches)*		
Muskmelons	Very tender	½ ounce	4	3 in row 4-5 per hill	12, single plants 36, hills (3 plants per hill)	48-72	1
Mustard	Half-hardy	1 packet	—	20	1-2	12-18	½
New Zealand spinach	Tender	1 ounce	—	4-6	12	24-30	1
Okra	Very tender	1 packet	—	3	12-15	36	1
Onions, from seed	Hardy	¼ ounce	—	10-15	2-4	12-18	½-1
Onions, from plants or sets	Hardy	2-3 pounds 400 plants	—	—	1-4	12-18	1-4
Parsley	Half-hardy	1 packet	—	10-15	4-6	12-18	½
Parsnips	Half-hardy	1 packet	—	15-20	3-4	18-24	½-1
Peas	Half-hardy	1 pound	—	10-12	Do not thin	18-24	2
Peppers	Very tender	50-75 plants or 1 packet seed	8-10	—	18-24	18-24	(b)
Potatoes	Half-hardy	10-12 pounds	—	1	10-12	24-36	4
Pumpkins	Very tender	1 ounce	—	1-2 in row 4-5 per hill	24-36, single plants 72, hills (3 plants per hill)	84-120	1
Radishes, spring	Half-hardy	1 ounce	—	10-15	1	12-18	½
Radishes, winter	Half-hardy	1 ounce	—	10-15	2-4	12-18	½
Rhubarb	Hardy	30-50 plants	—	—	24-36	36-48	(b)
Rutabaga	Half-hardy	1 packet	—	4-6	6-8	18-24	½
Salsify	Half-hardy	½ ounce	—	10-12	2-4	18-24	½
Soybeans, edible	Tender	1 ounce	—	8-10	Do not thin	24-30	1½
Spinach	Hardy	1 ounce	—	12-15	2-4	12-18	½
Squash, summer	Very tender	1 ounce	—	2-3 in row 4-5 per hill	18-24, single plants 48, hills (3 plants per hill)	36-48	1

TABLE I PLANTING CHART (*continued*)

				Spacing in row			
Vegetable	*Hardiness*[a]	*Amount for 100 ft. of row*	*Time required to grow plants from seed before setting in field (weeks)*	*Seed to sow per foot*	*Distance between plants when thinned or transplanted (inches)*	*Distance between rows (inches)*	*Planting depth (inches)*
Squash, winter	Very tender	1 ounce	—	1-2 in row 4-5 per hill	24-36, single plants 72, hills (3 plants per hill)	84-120	1
Sweet corn	Tender	1-2 ounces	—	1-2 in row 4-6 per hill	9-12, single plants 36, hills (3 plants per hill)	24-48	1-2
Sweet potatoes	Very tender	100 plants	6	—	12-18	36-48	(b)
Tomatoes	Very tender	35-75 plants or 1 packet seed	5-7	—	18-36	36-60	(b)
Turnips	Hardy	¼ ounce	—	6-8 15-20 (greens)	2-4	12-18	½
Watermelons	Very tender	½ ounce	4	1-2 in row 4-5 per hill	24-36, single plants 72, hills (3 plants per hill)	84-120	1

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[a] This classification is used to determine earliest safe date to plant vegetables. *Hardy* vegetables can be planted as soon as the ground can be prepared. *Half-hardy* vegetables can be planted as early as 2 to 3 weeks before the average date of the last 32° F freeze in the spring. *Tender* vegetables should be planted from the time of the last average 32° F freeze to one week later. *Very tender* crops should be planted 2 to 3 weeks after the last average 32° F freeze.

[b] Use plants.

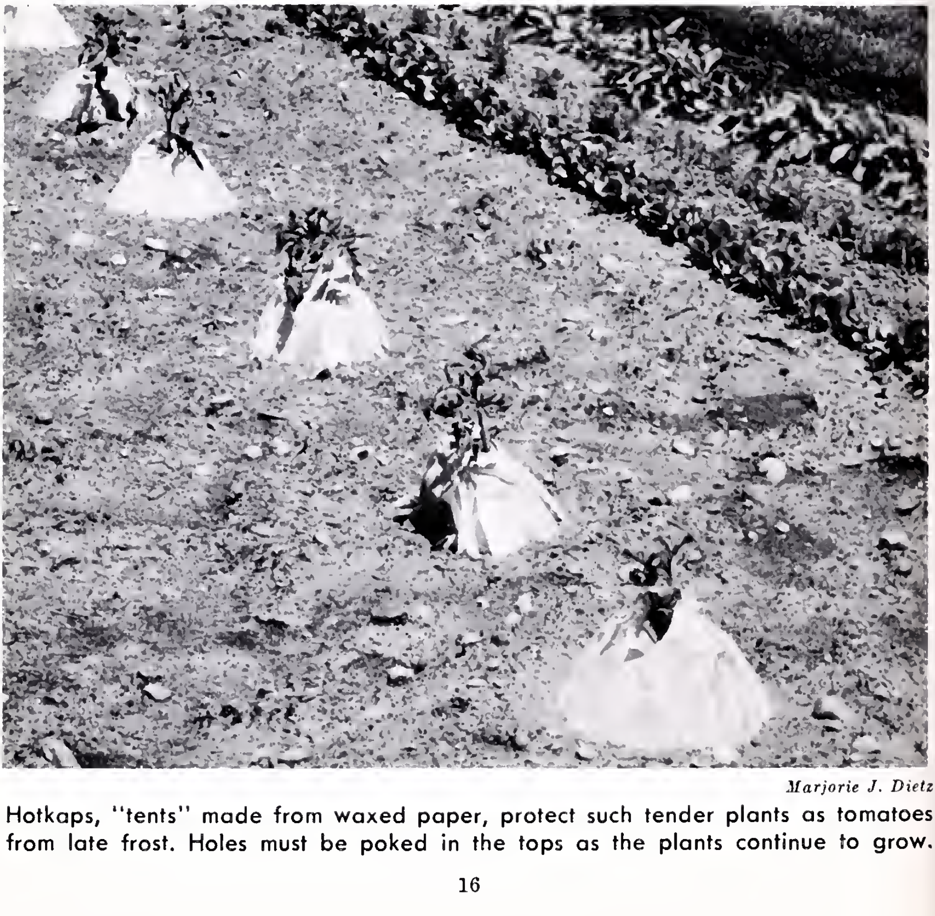
[c] Plants may be used.

straight rows to make cultivation, insect control and harvesting easier. To mark a row, drive two stakes into the ground at either end of the garden and draw a string taut between them. Shallow furrows suitable for fine seed can be made by drawing a hoe handle along the string. For deeper furrows, use a corner of the hoe blade. For spacing between rows, the number of seeds per foot and the depth of planting, see Table I.

Sweet corn, squash, melons and cucumbers are often planted in hills—that is, several seeds are set close together at definite intervals in the row instead of being uniformly spaced. Hilling allows easier control of weeds.

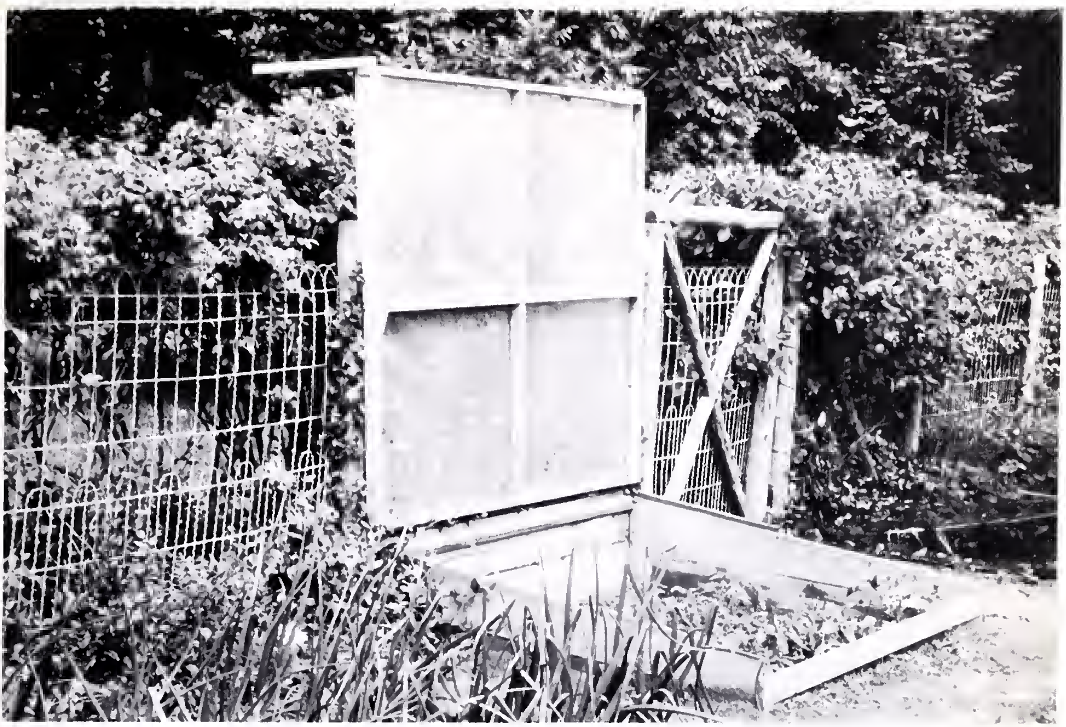
Small seeds are difficult to distribute thinly and evenly. They are easier to space out if mixed with dry pulverized soil before sowing. The plastic seed tapes now available at garden centers and other outlets have seeds set at precise intervals and are a convenient and accurate method of planting fine seeds, especially for beginners. After sowing, cover seeds and firm the soil gently by tamping with your hands or with an upright hoe. This prevents rainwater from washing seeds away. If the soil is dry at planting time, moisten the top 2 inches by sprinkling, using a fine spray to avoid washing or packing the soil. Water just often enough to keep a crust from forming. After seedlings appear, water less often but more deeply.

Thin seedlings to stand at desired intervals as shown in Table I. Always remove the weakest plants. Do not wait too long before thinning as the remaining plants will be injured by crowding or by root disturbance.



Marjorie J. Dietz

Hotkaps, "tents" made from waxed paper, protect such tender plants as tomatoes from late frost. Holes must be poked in the tops as the plants continue to grow.



A coldframe is a practical adjunct to the home vegetable garden. A simple coldframe can be made from scrap lumber with plastic used instead of glass.

Transplanting

Transplant on a cloudy day or in the evening. About an hour before transplanting, thoroughly water the plants and soil in the containers. Plants in flats should be blocked out in squares with a sharp knife to keep the root mass intact. To remove plants from pots, support plant and soil with the fingers, invert the pot, and knock the rim against a wooden surface such as the edge of a wheelbarrow. Peat and other fiber pots can be set directly in the planting holes as they will disintegrate in the ground. Be sure to keep the soil around the planted peat pot moist after planting to allow roots to penetrate into the soil. Maintaining soil moisture around fiber pots is necessary for several days after planting. Place the transplant in the ground slightly deeper than it grew in the container.

Use a "starter" fertilizer solution to help overcome transplanting shock and to get your plants off to a fast start. A starter solution is an all-soluble fertilizer high in phosphorus: 10-52-17 or 10-50-10. Mix the fertilizer with water at the rate of 2 tablespoons per gallon. As you set the plant in the soil, pour one cup of the solution around the roots. Firm soil around the roots, then finish filling the hole, leaving the surface loose.

Newly set plants should be protected against heat, cold and wind. Plant protectors such as Hotkaps made of paper or plastic will protect tender plants from late frosts. Homemade shelters include boxes, baskets and flower pots which can be stuffed with hay or dry leaves if a severe frost threatens. Do not leave protectors over the plants longer than necessary. If it gets warm during the day, remove the protector or open it so that the plant gets ventilation. A shingle thrust into the ground on a slant on the south side of a plant will serve as a sunshade. Failing a supply of shingles, a cocked hat folded from newspaper will make a temporary shade.

Mulching

Mulches which cover the soil in the vegetable garden will benefit both vegetables and gardener by making cultivation unnecessary. Information on methods and types of mulches will be found in the articles on individual vegetables. ◆

Choose varieties suitable for the home garden rather than a truck farm

SELECTING VEGETABLE VARIETIES FOR THE HOME GARDEN

W. Ray Hastings

VEGETABLES for the home garden are bred for entirely different qualities from those designed for commercial use. The folk-saying that the ideal cabbage is one that can be kicked to market and arrive in saleable condition is an illustration of the difference in aim. The criterion for home garden vegetables is high quality, flavor and tenderness, whereas commercial varieties are selected primarily for durability under shipping and storage.

Another distinction is that commercially grown vegetables are bred to ripen all at the same time. This is necessary because mechanical pickers must gather the entire crop in one operation, often destroying the plants in the process. In the home garden, all-at-once ripening would confront the cook with ten bushels of green beans one week and none at all the next. The home gardener seeks varieties that produce a succession of buds in order to extend the harvest over many weeks.

The lucky gardener who picks his vegetables on the way to the kitchen can ignore shipping qualities and concentrate on his chief interest, which is to produce vegetables superior to those offered at the supermarket. He is free to choose varieties solely for tenderness and flavor and—just as important—can harvest them at their moment of perfection: tender young sweet corn with its kernels still milky and translucent, and tomatoes on the point of bursting with ripeness.

The following varieties, both old and new, are especially recommended for the home garden. Many of these are All-America Selections award winners, identified by the red, white and blue shield on the seed packet.

Beans

Green (snap) bush beans. 'Tendergreen' won prizes forty years ago and is still a popular round-podded, stringless variety. 'Bush Blue Lake' is a late variety of high quality, with small white seeds which are slow to develop. 'Tendercrop,' rich-flavored and free from fiber, is especially suited to home growing.

Green pole beans. 'Kentucky Wonder' bears heavily over a long period. Its pods are round, thick and meaty. Dried beans are light brown. 'McCaslan' has flat, brittle pods and ivory-white seeds. Both varieties are stringless when young.

Bush wax beans. 'Cherokee Golden Wax' is early and disease resistant. Its light yellow oval pods are crisp and fleshy. Dried seeds are black. 'Kinghorn Wax' is a white-seeded variety with round, dark yellow pods, tender and flavorful.

Lima beans. 'Fordhood 242' remains the most desirable and reliable variety. It withstands drought and matures in about 70 days.

Note: Bush beans have rather concentrated yields so should be planted in short rows at two-week intervals. Pole green beans mature later but have a much longer bearing season and are noted for superior flavor.

Beets

'Perfected Detroit' and 'Ruby Queen,' are dark red, globular, fine grained and flavorful. 'Ruby Queen,' extra sweet and tender, is excellent for the home garden.

Roche

Two very popular kinds of lettuce with home gardeners: a Boston-type lettuce variety *(top)* and 'Bibb' *(below)*. Boston lettuces have buttery-textured leaves.

Broccoli

The hybrid 'Green Comet' is rated top quality. Its broad, compact, fine-budded head is deep blue-green in color and stays long in good condition.

Brussels Sprouts

'Jade Cross' is an outstanding hybrid producing a prolific crop of medium-sized, solid, tightly wrapped sprouts.

Cabbage

'Emerald Cross' is a choice, early round-headed cabbage which stands well without bursting. 'Savoy King' is an excellent crinkled-leaf type for home garden or quality market. 'Ruby Ball' is the newest and best red cabbage.

Carrots

Carrots need eight weeks or more to mature but young, sweet and tender roots can be pulled earlier. Where the soil is deep and mellow, long-rooted types like 'Gold Pak' may be planted. In heavy clay or stony soil, use shorter-rooted sorts such as 'Nantes' or 'Royal Chantenay.'

Cauliflower

'Snow King' is a superior early hybrid of 'Snowball' type.

Corn

Space-consuming but incomparable when picked young and eaten within minutes. The latest novelty in sweet corn is the hybrid 'Early Xtra Sweet,' advertised as having twice the sugar content of standard varieties and as being slower to convert sugar to starch. 'Golden Beauty,' extra early, sweet and tender, is recommended for regions with short growing seasons. 'Iochief,' is a 90-day main crop variety which stands drought.

(Continued)

Cucumbers

To save garden space, cucumbers may be trained on a post or fence. 'Triumph,' a new disease-resistant hybrid for slicing, is a heavy yielder.

Eggplant

'Black Beauty' is the standard variety. 'Florida Special' is a tall variety which holds its fruit well off the ground, an important consideration in areas with heavy rainfall.

Lettuce

'Bibb' is considered the most delicate and delicious of the butterhead lettuces but it quickly bolts to seed in hot weather. 'Buttercrunch' is more tolerant of heat and so takes top rating for long-season yield. It is similar to 'Bibb' but with larger heads of thick, crisp, delectably flavored leaves. 'Salad Bowl,' an improvement on the old 'Oak Leaf,' has attractively notched and waved leaves. 'Ruby' is another fancy leafed variety tinged with bronzy red. It is heat resistant and slow bolting but must be eaten young for sweetest flavor. Home gardeners usually plant the easier, better flavored looseleaf lettuces, but for those who want to attempt head lettuce, 'Butter King' is rated the most satisfactory of the Boston type. So-called Iceberg types are hard, coarse-ribbed varieties bred for ability to stand shipping rather than for flavor and delicate texture.

Onions

Onions and their relatives—chives, garlic and shallots—are usually grown from sets (young plants) by home gardeners. Sets of yellow and white varieties selected for performance in a particular area are available from garden centers and seed houses.

Peas

Peas need cool weather so plant very early or for autumn picking. 'Alaska' is the earliest and perhaps the surest bearer as it matures before hot weather but the variety is deficient in sugar. 'Freezonian' is sweeter and larger, a week later and wilt resistant.

Peppers

'Bell Boy,' a recent prize winning hybrid, and 'Yolo Wonder' are thick meated, chunky and resistant to tobacco mosaic.

Radishes

The favorite crop of children is radishes—ready to harvest in just three weeks after planting. 'Cherry Belle' is easily the most popular as it holds its crispness for a long time. 'Champion,' larger in size, also stays crisp. 'White Icicle' is the best long-rooted white radish, with mild flavor and crisp texture.

Squash

For a diversity of summer squash, plant 'Yellow Summer Straightneck,' 'Hybrid Chefini,' a dark green cucumber-shaped zucchini; and 'St. Pat Scallop,' the best Patty Pan squash. All summer squash should be used when young and tender, only 4 or 5 days after blossom drop. Frequent picking will keep the vines bearing. Among winter squashes, 'Waltham Butternut' (tan) and 'Table Queen' or 'Acorn' (black-green) are vining types which spread widely. Where garden space is limited, the early 'Golden Nugget' is a good choice. It is a compact, bushy plant producing bright orange fruit close to the base of the plant.

Tomatoes

The most popular vegetable for home growing, now available in hybrids that combine quality fruit with resistance to disease. 'Moreton Hybrid' is early, solid and meaty. 'Wonder Boy' is considered by some growers to be the best flavored of the large hybrids, and 'Better Boy' is a close rival. 'Spring Giant' is reported to give satisfaction throughout the country, producing large fruits on relatively small vines. 'Small Fry' is the best cherry type with an abundance of one-inch fruit. 'Sunray,' mild tasting and low in acidity, is the favorite yellow tomato. ◆

Short of garden space but still want to grow your own vegetables?

MINI-VEGETABLES FOR MINI-GARDENS

Joseph M. Lent

THERE are a number of midget vegetables which have been designed for limited growing areas. They mature quickly and are of excellent eating quality. Most of these vegetables can be grown in very small plots of ground, in combination with the flower garden, or in individual containers, such as pots, tubs, window boxes, bushel baskets or plastic pails. Following are some mini-varieties, all of which require the same culture as the standard-sized ones:

CABBAGE—An exceptionally early midget variety is 'Dwarf Morden.' It produces heads that are only 4 inches in diameter, yet are firm and round and have a very sweet flavor. It may be planted as close as 8 inches apart in the row, and the rows need be only 12 to 14 inches apart. This cabbage could also be grown in tubs or bushel baskets. 'Little Leaguer' cabbage is another dwarf variety with heads about the size of a softball. It can be cooked whole.

CARROT—A truly flavorful baby carrot is 'Tiny Sweet.' It is golden orange and grows to 3 inches in length. It is adapted to most soils. The plants should be thinned to 1½ to 2 inches apart. Another choice small carrot is 'Short 'n Sweet,' flavorful and bright orange throughout. It also does well in heavy or light soils. Carrots can be grown in any convenient container, from 1 gallon- to 5-gallon size.

CUCUMBER.—The variety, 'Cherokee,' a hybrid, produces a heavy crop of fruit on 3-foot vines within 60 days. The cucumbers may be picked while small for pickling or allowed to develop fully to 7 inches for use in salads. In order to produce high yields, this variety requires heavy watering and fertilizing. 'Cherokee' is resistant to mildew and leafspot. If a container is to be used, 2 or 3 plants in a 5-gallon size would be satisfactory.

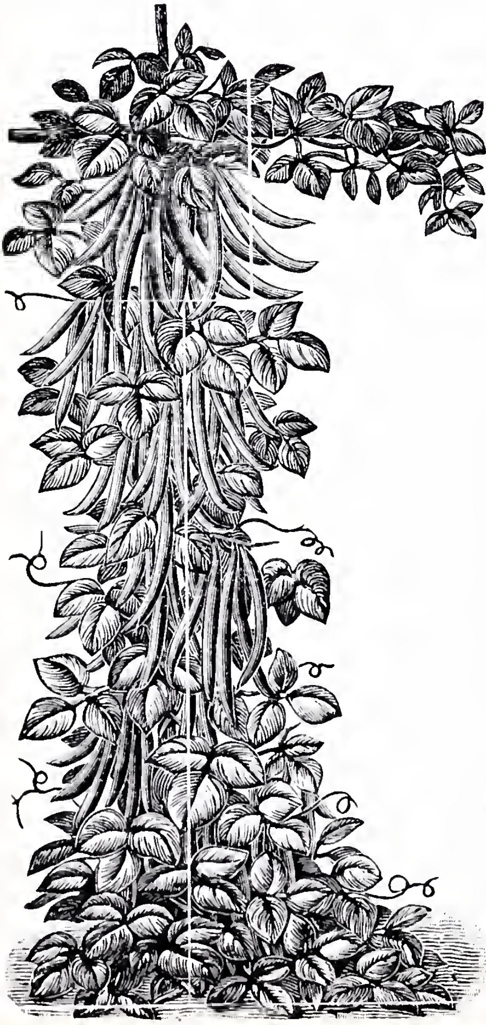
SWEET CORN—There are two good yellow miniature varieties, 'Golden Midget' and 'Midget Hybrid.' The former produces 4-inch ears on 30-inch plants in less than 60 days. The latter matures a few days later and produces 5-inch ears. Both of these varieties are very sweet and of high quality for early corn. If a white corn is desired, 'White Midget' would be a good seletion. The ears grow 4-6 inches long on stalks 2½-3 feet tall. Miniature corn seed should be spaced 6-8 inches apart in the row and the rows 2 feet apart. It is important that all sweet corn be planted in 2 or more rows, even though the rows are very short, in order to insure good pollination. Corn must be planted where it will receive full sunlight. Although not usually considered suitable for growing in containers, 4 plants per 5-gallon container might prove to be satisfactory.

EGGPLANT—A very early variety is the 'Morden Midget.' This is a small sturdy and bushy plant which bears medium-sized deep purple fruits of very high quality. The plants should be placed 1½ feet apart in the row and the rows 2 feet apart. One plant could be grown in a 3-5-gallon container.

HEAD LETTUCE—A tennis-ball size butterhead type is the 'Tom Thumb.' It is an exceptionally crisp quality lettuce that is served whole as individual salads at some famous hotels. It lends itself well to container-growing on porches or patios. Eight inches growing space should be provided for each plant.

PEAS—An unusually early crop to plant that takes little space is the 'Mighty Midget' pea, which produces an abundance of 3½-inch pods on 6-inch vines. The peas are tender and sweet. The seeds are usually spaced 1 inch apart in the row and the rows 1½ feet apart. A small crop of this interesting variety could be grown in a window box.

SQUASH—Bush types requiring approximately 4–6 square feet per plant, can be grown in small spaces. A good summer squash for this purpose is 'Baby Crookneck' which starts producing a large number of bright yellow fruits in 53 days. A green zucchini type is 'Chefini.' It continues to produce excellent dark green fruits as long as they are picked regularly from the plants. A new bush patty-pan type is 'St. Pat Scallop Hybrid.' Its green fruits should be picked when 2-3 inches in diameter to obtain the best flavor. Constant picking insures a continuous crop. An excellent winter bush type is 'Golden Nugget.' Its fruits are bright orange and weigh about 1½–2 pounds. They are round or flattened at the ends, with thick orange meat, and can be cooked whole at 250° F. This variety lends itself well to winter storage.



TOMATO—Several mini-types have been developed, with perhaps 'Tiny Tim' the favorite. This plant grows only to 6 inches in height and 14 inches across. It produces its bright red clusters of ¾- to 1-inch fruits in 45 days and continues to bear. It is a most attractive plant and can be used as an ornamental in the garden or in a window box. 'Pixie' and 'Patio' tomato varieties produce larger fruit than 'Tiny Tim,' but can also be grown in limited areas or containers.

MUSKMELON—An excellent 4-inch melon that ripens in 60 days is the 'Minesota Midget.' It has small vines, extending only 5 feet, but bearing a large number of delicious fruits with high sugar content. These can be spaced 3 feet by 3 feet or 1 or 2 plants can be set in a 5 gallon container in full sun.

WATERMELON—A small 6-pound melon that ripens within 80 days is the hybrid variety 'Early Midget.' It is a red-fleshed, sweet, crisp melon. A good 70-day maturing variety is the 'New Hampshire Midget.' Its fruits are 7 inches long, 6 inches across and weigh about 6 pounds. It has a very thin rind and solid red flesh. The watermelon is not adapted to container growing and these varieties should be planted in 4- to 6-foot squares.

Additional information on mini-gardening can be found in the USDA *Home and Garden Bulletin No. 163.* It can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for 15 cents. ◆

To avoid working harder in your garden than necessary, choose the right tool

GARDEN TOOLS AND EQUIPMENT

Edward L. Palmer

ONE WAY to save time and effort in the garden is to use the right tool or piece of equipment for the job you are doing.

Basic Garden Tools

The number of different tools used in the vegetable garden really depends on the habits and degree of interest and enthusiasm of the gardener as well as the size of his garden. Most home gardening can be accomplished with as few tools as a trowel, spading fork, steel rake, garden hoe and heavy string for laying out straight rows. A larger garden can require the addition of a seed planter and a wheel cultivator or some type of power-drive tillage equipment.

It pays to purchase tools of good quality, even if it means building your tool collection slowly. Cheap tools quickly become worthless and frustrating to use. Good tools, given care, will often last a lifetime.

Care and Storage of Tools

Here are some maintenance and storage suggestions you will find helpful.

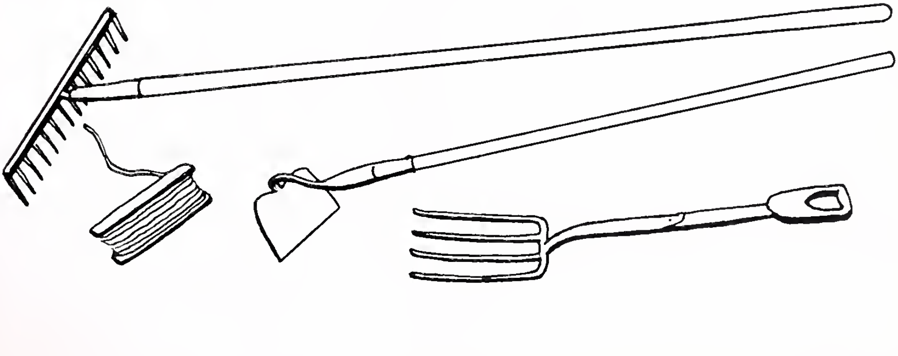
Clean Tools. All soil, rust, grass and other deposits should be removed from tools before putting them away. A wire brush is useful for this job. To ease the daily cleaning job you can keep a bucket of sand mixed with a little lubricating oil near the tool shed or storage area. When you have finished using a garden tool, plunge it into the oily sand a few times. This cleans and oils in one operation.

Keep Tools Sharp. Bills for repairs and replacements can often be avoided by attention to the cutting edges and moving parts of your tools.

Lubricate. A little oil on moving parts doesn't cost much but will do wonders in easing work.

Tighten Screws and Bolts. Who enjoys working with tools that are loose and half apart?

Keep Tool Handles Smooth and Tight. There are several approved methods of tightening loose handles. If the tool is of the shank type, for example, a hoe,



Eva Melady

A small garden can be maintained with as few tools as rake, hoe, fork and line.

rubber-base adhesive (not common rubber cement) can be applied to the shank before inserting it into the handle. If the shank is very loose, use thin strips of tin as shims between the shank and the hole in the handle. Some tools can be tightened on their handles by soaking the tool end in either linseed oil or motor oil. The oil serves two purposes: it swells the wood fibers which tighten the tool head to the handle, and it keeps moisture out of the wood fibers. Fine sandpaper smoothes wood handles made rough by weathering. Finish with several coats of raw linseed oil.

Use Tools for Their Intended Purpose. Shovels, spades and hoes aren't designed for use as crowbars: don't pry with them! Nor are pruning shears made for cutting wire or pulling nails! Using the right tool for the right job can be important to the welfare of the operator. Back strain and sore muscles are less likely to result when long-handled shovels or spades are used for extensive soil digging and lifting.

Store Tools Properly. Provide a definite place to store each tool when not in use. Nails in boards mounted on the wall make a good tool rack. Two nails with a small space between, will hold most tools. Stored tools should be protected from rust by coating with oil, grease or other rust inhibitor.

Storage Building or Shed. Plans for the construction of small tool or garden sheds or utility buildings are available from most Land Grant Universities. Or prefabricated sheds of varying designs and materials are sold by department stores, garden centers and mail-order and equipment concerns. Such storage facilities should be given convenient locations, yet placed where they are not eyesores on the property.

Longer Life for Your Garden Hose. A garden hose is an important piece of equipment for the home gardener. If you want it to be in first-class condition, buy a good hose and take care of it. The number-one enemy of a garden hose is prolonged exposure to sunlight and oils. After use, clean with plain water only, drain hose and wipe it clean before storing.

Lacking a storage reel, you can make a storage rack from a bushel basket. The basket may be hung on a wall by securing the bottom of the basket to the wall with nails or it may be stored on the floor. If secured to a wall, wrap the hose around the outside of the basket, if stored on the floor, coil the hose inside the basket. In either case, use the space in the center of the basket for storing your sprinkling devices, pruning shears and other small garden equipment.

Never hang a garden hose over a nail; use either a storage rack or a reel.

Spraying and Dusting Equipment

The control of insect pests and plant diseases makes it necessary for most gardeners to have some type of equipment for applying either dust or liquid insecticides and fungicides. There is available a type and size of sprayer for every use and they may be either hand- or power-operated. Although both hand- and power-operated dusters are available, the average home gardener would have little use for a power-driven duster.

Atomizer or Hand Sprayer. A household-type sprayer suitable for spraying small areas. It is inexpensive but does a suitable job of applying spray material to a limited number of plants.

Compressed-Air Sprayers. Usually a cylindrical tank equipped with an air pump. Tank capacities range from 2½ to 4 gallons of liquid and an air space. The air pump is used to pump air into the tank and force the liquid out when the valve is open. This is a popular type of home garden sprayer.

Knapsack Sprayer. A tank carried on the back and shoulders of the operator. A lever handle at the bottom of the tank is used to build up air pressure in the air chamber which forces the spray out while the cut-off valve is open.

Bucket Sprayers. The bucket sprayer uses a single-action (pumps on the down stroke only) liquid-type pump that rests inside the bucket. A footrest, attached to the pump, sits on the ground outside the bucket to hold and steady the pump. Liquid is forced through the spray nozzle by the pump at a strong, continuous flow.

Wheelbarrow Sprayers. One advantage of a wheelbarrow sprayer is the ease with which it can be moved about. The unit consists of a tank mounted on a frame similar to a wheelbarrow, and a liquid-type pump. The pump applies pressure on the spray liquid, forcing it out the spray nozzles. Many wheelbarrow sprayers have a pressure tank which the liquid is forced into so that additional pressure can be applied to the spray material.

Power Sprayers. Power sprayers may be operated with either a small gasoline engine or an electric motor. Most power sprayers are of the type in which pressure is developed by a pump action directly on the liquid spray material.

Power sprayers, like hand-operated sprayers, are available in a variety of sizes. Unliike most hand-operated sprayers, power sprayers should have controls for regulating the amount of pressure that is developed. A pressure regulator, a relief valve and a pressure gauge should be on all power sprayers.

Hand Dusters. The small hand-pump duster is useful when only a few vegetables are to be dusted. The end of the nozzle is turned up so the dust will be able to reach the underside of leaves.

Crank Dusters. The crank duster is useful in the average-size garden and is provided with both single and double nozzles. The air for carrying the dust is provided by a hand-operated fan. This type duster is the most popular with home gardeners.

Knapsack Dusters. The chief difference between the crank and the knapsack duster is the method of supplying the air. The knapsack duster uses bellows to provide air. It is also a popular duster with home gardeners.

Power Garden Equipment

Power equipment is available for just about every job around the lawn and garden. This use of machines, both electric or gasoline powered, has made work easier and faster, but also has introduced many maintenance problems and new causes of accidents. (See page 27.)

When choosing a piece of equipment it is important to know the size and type you want as well as its safety and construction features. You will usually find a wide selection of models, sizes and differences in quality of construction. Naturally, the more expensive one will contain more desirable features.

Equipment Powered by Electricity

Electricity is being used to power rotary hoes, cultivators, sprayers and the all-electric-riding garden tractor which has many available attachments.

Electrically-powered equipment has some advantages over equipment powered by a gasoline engine. An important advantage today is that this equipment produces less noise and air pollution. The motor in electrical equipment is easier to service and maintain and the danger of handling and storing gasoline is eliminated.

One of the main disadvantages of using electricity to power garden equipment is that electrical outlets are not always available at the place where the equipment is to be used. Of more importance are the electrical hazards that can result when using such equipment outdoors.

All portable electric equipment used outdoors should bear the "Underwriters' Laboratory, Inc." (UL) label, as should all electrical wiring materials. All electrical wiring should conform to the rules and standards of the local electrical code.

All portable electric equipment, except that with the new double insulated motors, should be equipped with a three-wire grounding cord and plug. Any electrical device having a metal enclosure or exposed metal part could, through some circumstance, come in contact with the

Wire Size and Length of Extension Cords

Light Loads (to 840 Watts, 7 Amperes)	*Medium Loads* (840—1200 Watts) (7—10 Amperes)	*Heavy Loads* (1200—1800 Watts) (10—15 Amperes)
To 25 Ft.—Use No. 18	To 25 Ft.—Use No. 16	To 25 Ft.—Use No. 14
To 50 Ft.—Use No. 16	To 50 Ft.—Use No. 14	To 50 Ft.—Use No. 12
To 100 Ft.—Use No. 14	To 100 Ft.—Use No. 12	To 100 Ft.—Use No. 10

Overloaded extension cords overheat (this can be dangerous!), waste electricity and sometimes fail to deliver enough power to run motors and appliances at top efficiency.

the device, resulting in a "short." In such a case, the fuse might not "blow," thus leaving the person operating the equipment unprotected. When a three-wire grounding plug and cord are used to properly ground the equipment, the "short" causes the fuses to "blow," and the operator is protected. Even though this type of grounding is provided, it is useless unless properly connected. If in doubt as to the correct way to make the connections, consult the local power supplier or a competent electrician.

Electrical Extension Cords

Extension cords, other than those attached to the power tool, should be selected to fit the requirements of the electric equipment. For outdoor use, three-wire-type-S or type-SJ extension cords should be used. The third wire is used for grounding. Grounding-type plugs should also be used.

Wires used to make cords come in many sizes. Wire sizes are designated by American Wire Gauge numbers, such as 18, 16, 14 and so on. The wire size increases as the number becomes smaller; number 16 wire is larger than number 18. The above table can be used as a guide to help select the proper wire size for extension cords.

Tools and Equipment Powered by Small Gasoline Engines

Vegetable garden equipment—tractors, cultivators, rototillers, shredders and others—powered by small gasoline engines

to speed maintenance and soil cultivation.

Most small gasoline engines are well designed and sturdily constructed. However, like any other piece of machinery, their performance is determined by their level of upkeep.

To help understand what makes a gasoline engine run and the care it needs, the manufacturer supplies (with each new engine) an Owner's or Operator's Manual on the operation and care of the engine and machine. It should be kept handy for ready reference on such matters as adjustment, cleaning, lubricating and servicing.

Safety Features

All moving parts of power equipment should be completely covered with safety guards or a shield. These guards should be of the type that are not easily removed or left off while the equipment is in use.

The method of starting and stopping the engine should be convenient and safe and one that keeps hands and feet from moving parts.

Servicing Information

All equipment requires periodic service. The type that is easily maintained, of course, will receive better service and last longer. For instance, ball or roller bearings require less maintenance than sleeve bearings. A four-cycle engine is more efficient and easier to keep in proper adjustment than the two-cycle type. Heavier constructed tools and equipment are a better investment than the light-weight cheaper models. Parts will last longer and be safer to use.

Trouble Shooting

Not everyone wants to be a mechanic but there are some repairs that the owner can perform. They should make the services of a mechanic necessary only after long intervals. Use a systematic method when trying to determine why an engine will not start or run properly.

Some of the common troubles that an operator can correct without calling a mechanic are listed in the table below.

Storing a Gasoline Engine

A gasoline engine, like any other piece of equipment, requires some special attention when it is not in use. Short-time storage, during the season the engine is being used, should be in a handy dry place

Marjorie J. Dietz

A gasoline-powered rototiller speeds garden cultivation and maintenance.

Type of Trouble	Most Likely Cause
Engine Fails to Start	No fuel in tank Fuel shut-off valve closed Fuel line clogged Sediment in carburetor Broken or grounded ignition cable Ignition cable loose Spark plug cracked, broken or fouled
Engine Hard to Start	Water in fuel Improper fuel mixture (in case of 2 cycle engine) Improper choking Obstruction in fuel lines or carburetor Improper carburetor adjustment Loose or defective ignition cable Loose spark plug Dirty or corroded breaker points
Engine "Missing"	Spark plug cracked or fouled Improper spark plug gap Dirty or corroded breaker points Ignition cable broken, loose or shorted out
Engine Overheating	Choke partly closed Obstruction in air passages
Engine Lacks Power	Air cleaner clogged Improper gas mixture Choke partly closed Overloaded Carburetor out of adjustment

under cover. Engines stored for two months or longer should be serviced according to the instructions in the Operator's Manual. The following procedures are important:

1. With the engine warm, drain the crankcase (four-cycle engine) and refill with fresh oil of proper viscosity and type.
2. Completely drain all gasoline from the fuel tank, fuel lines, and carburetor to prevent gum deposits from forming.
3. Remove spark plug and pour about a tablespoon of clean oil into cylinder.
4. Replace spark plug, cleaned and properly adjusted, or install a new one.
5. Thoroughly clean the engine. Remove blower housing and clean all dirt and chaff from cylinder head and fins. Replace blower housing.
6. Service air cleaner.
7. Tighten all loose screws and bolts.
8. Cover engine with canvas or blanket and store in a dry place under cover.

When the engine is taken out of storage, remove the spark plug and spin the engine, by pulling the starter cord, to remove the excess oil from the cylinder. Replace the spark plug. Fill the gasoline tank with clean fresh fuel. If the engine was properly serviced for storage, it should be ready to use. ◆

Storage of Vegetables

MANY vegetable gardens will produce more than the family is able to consume during the growing season. Proper storage of the excess harvest will continue the enjoyment of home-grown vegetables into the winter months. Beets, cabbages, carrots, endive, kohlrabi, parsnips, onions, pumpkins, squash and turnips are the most commonly stored vegetables. Tomatoes, cucumbers and melons may also be stored but not for an extended period of time.

Most vegetables should be stored in a clean, dark, fairly humid area with a temperature ranging from 34° to 40° F. Exceptions are tomatoes, cucumbers, melons and pumpkins which require a temperature of 50° to 75° F for best storage. All storage areas should be well ventilated.

Vegetables selected for storage should be mature and sound, although carrots, beets and turnips are best if harvested slightly before reaching maturity. Care should be taken in handling all vegetables for storage in order to avoid bruising.

More detailed information on this subject can be found in the USDA *Home and Garden Bulletin, No. 119,* "Storing Vegetables and Fruits in Basements, Cellars, Outbuildings and Pits." This bulletin may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.—*Joseph M. Lent*

A native American delicacy of unsurpassed quality

SWEET CORN FOR THE HOME GARDEN

Albert A. Banadyga

THERE is nothing more delicious than freshly harvested sweet corn which comes to the kitchen pot straight out of the garden. The home gardener can easily capture its maximum quality by harvesting at the stage of peak succulence and sugar content.

Sweet corn is a warm season vegetable. Most varieties require temperatures above 65°F. for proper growth and maturity. An ample supply of moisture is necessary. The water requirement will vary with the soil type and temperature but an average of one inch of water per week, from rain or irrigation, is necessary for a successful harvest. Hot drying winds, with temperatures above 90°F. at the time silk forms, will interfere with pollination and result in lower yields and quality.

Most present-day varieties are hybrids with yellow kernels, although there are many open-pollinated and white varieties which are excellent. Most hybrids are selected for their adaptability to specific growing conditions. Check with your local agricultural representative and seed dealers to determine which varieties are best adapted to your area.

Descriptions of varieties usually indicate the number of days required from planting until harvest. This varies from about 65 to 110 days. These are average figures for each variety and will fluctuate from one area to another, depending primarily on growing temperatures. Normally, the higher the growing temperature, the earlier a variety will mature. Varieties requiring 65 to 80 days are often classed as "early," 81 to 90 days as "mid-season" or "main crop," and 91 days and over as "late."

Sweet corn seed remains viable for about one year, thus seed should not generally be saved from one year to another. Since the corn plant is open-pollinated, do not save seed from your growing corn plants since the saved seed will not be true to variety. If possible,

Sweet corn ears should be in the kitchen pot minutes after picking—a feat not difficult to achieve when corn is grown in the home garden.

purchase seed which has been treated against soil-borne insects and diseases. The seed packet will indicate if seed has been treated.

Soil and Fertilizers

Corn will grow well on most well-drained soils, although a loamy soil well supplied with organic matter is preferable. If other crops and weeds grow well in your soil, it is suitable for sweet corn. Corn is not very sensitive to soil acidity and is successfully grown in soils ranging in pH from 5.5 to 7.0.

Fertilizer suggestions vary according to soil type and previous soil treatment. A typical fertilizing program is to broadcast 3 to 4 pints of a 5-10-10 fertilizer per 100 feet of row before planting. This fertilizer should be mixed well with the upper 6 to 8 inches of soil. An additional sidedressing should be applied when the corn is about knee-high, using about one pint of ammonium nitrate (or its equivalent) per 100 feet of row. Specific recommendations may be obtained from your local agricultural agencies or by having your soil tested. Fertilizer that comes into direct contact with seeds or plants will result in injury.

Before planting, soil should be thoroughly worked with a spading fork, tiller or plow to a depth of 6 to 8 inches. The prepared soil should be free of lumps or clods. Seeds are planted in rows 24 to 36 inches apart with one seed every 4 to 6 inches in the row. Plant seeds 1 to 1½ inches deep. Plant at least 3 rows of the same variety at one time to insure good pollination. With only a single row, much of the pollen that is produced on the tassels will be blown away before it falls on the silks thus resulting in ears that are not completely filled out. When the corn seedlings are 3 to 4 inches high, thin to a final stand of one plant every 8 to 12 inches in the row.

To have fresh corn over an extended period of time, the harvest period may be lengthened either by making successive plantings of the same variety every 10 to

season and late variety at the same time. In warm areas the succession plantings are usually preferred. In cool climates it is usually preferable to plant varieties of differing maturity dates at the same time.

Weed and Pest Control

Weeds are best controlled in the garden by using a mulch or by very shallow cultivation. Several insects may cause you some problems. Insects that might cause trouble are seed-corn maggot, wire worm, white grub, cutworm, flea beetle, European corn borer, aphids and corn earworm. Diseases which may cause damage are bacterial wilt, smut, leaf blight, seedling blight and stalk blight. To reduce pest damage, use treated seeds, select resistant varieties if possible, and rotate your crop in your garden plot. For additional control, consult your local agricultural agencies and garden supply dealers for suggested chemicals to use.

The pollen-producing tassels appear on the plant about 3 to 4 days before silks begin to show on the corn ear shoots. Normally, sweet corn is ready to harvest after the silks have turned brown, that is, about 15 to 20 days after the silk first appears. Warm temperatures hasten this maturity. In maturing, the kernels go through stages known as pre-milk, milk and dough stage. Harvest the corn at the milk stage when the kernels are plump and well filled, high in sugar content and still tender. At the proper stage of maturity, the ear feels plump, firm and well filled out all the way to the top. After ears are harvested, the sugars are converted to starch quite rapidly. This undesirable conversion is hastened as the temperature increases. It is best to harvest sweet corn in the early morning while it is still cool and to keep it refrigerated until ready for cooking. ◆

Leafy vegetables—a visual delight and taste treat when served fresh from the home garden

GREENS, LETTUCE AND OTHER SALAD VEGETABLES

J. Lee Taylor

GREENS and salad vegetables require little space in the home garden but the returns for the space they occupy are considerable. These leafy vegetables are low in calories, high in calcium, iron and vitamin A, and provide a pleasing contrast in color and texture to other food. One advantage of growing you own favorites among this varied group is the opportunity of harvesting them fresh as you need them—for many months of the year. You can also produce a far greater variety than you can buy in most produce departments.

In culinary terms, salad vegetables are those leafy vegetables intended to be eaten raw, as in the "tossed" salad. Greens, or potherbs in the old term, are meant to be cooked, but the division is by no means rigid. Cabbage, for example, is a salad when served as cole slaw and a green when boiled or steamed. Dandelions and spinach may also be used in either way. According to this classification of convenience, salad crops are preeminently lettuce, endive, chicory, cress and parsley can be included as it is important as a flavoring in potato and egg salads. Greens include beet and turnip tops, collards, spinach, kale and Swiss chard.

Cultivation

Most leafy vegetables grow best in cool weather and are planted to mature in the spring or fall. Swiss chard and New Zealand spinach tolerate warm weather and can be used as summer crops. If one part of your vegetable garden receives a few hours of shade, preferably in the heat of midday, you should consider planting leafy vegetables on that side.

A sandy loam is suitable for most leafy vegetables. Unless you have your soil tested for specific requirements, a general

Claude Johnston (Missouri Botanical Garden)

A better tossed salad results when as many of the ingredients as possible are gathered from the home vegetable garden. Included here is salad burnet *(Poterium sanguisorba)* whose attractive leaves have a mild cucumber-like flavor. The plant is often grown in herb gardens.

Paul Frese

A flat of lettuce seedlings started indoors and now ready to be set out in the vegetable garden. The quality of lettuce improves when the plants are transplanted into rich, humus-filled soil.

rule is to apply a complete fertilizer such as 10-6-4 at the rate of 10 pounds per 1,000 square feet. This should be thoroughly mixed with the soil before planting. When plants are well established, a light supplementary feeding may be applied along each side of the row and worked in with a hoe. If any fertilizer falls on the leaves, it should be hosed off promptly.

Salad Vegetables

Lettuce is without rival as the favorite salad green. Most home gardeners shun the tough Iceberg types and choose the tender, flavorful loosehead varieties. These are too delicate to stand shipping and storage and are seldom found in markets. They are the special privilege of the home gardener who can pick and eat them at their moment of perfection. A selection of loosehead or butterhead lettuces especially recommended for home growing will be found on page 18.

The loosehead lettuces are fast growing, maturing in 40 to 45 days, and are planted in frequent small sowings throughout the spring and again in late summer. The leafy varieties of chicory, variously called endive and escarole, take 90 days to mature and are suited to regions where autumns are long and cool and frost comes late. Both the curly and broadleafed varieties are improved by blanching, that is, by tying the outer leaves together when the plant has spread to about 15 inches across.

White mustard is popular in the South as a boiled green. However, the young leaves, used raw, give a novel piquancy to salads and sandwich fillings. For this purpose, make 3 or 4 successive plantings at 10-day intervals. The best crop is from plants that are growing rapidly.

Parsley is indispensable in potato, fish, vegetable and egg salads and so can qualify as a salad vegetable. The seed is extremely slow to germinate. Soaking it for six hours in warm water will speed the process. Many gardeners plant quick-sprouting radish seed in the same row to mark its location. Pulling the radishes acts to thin the stand of parsley when it eventually appears.

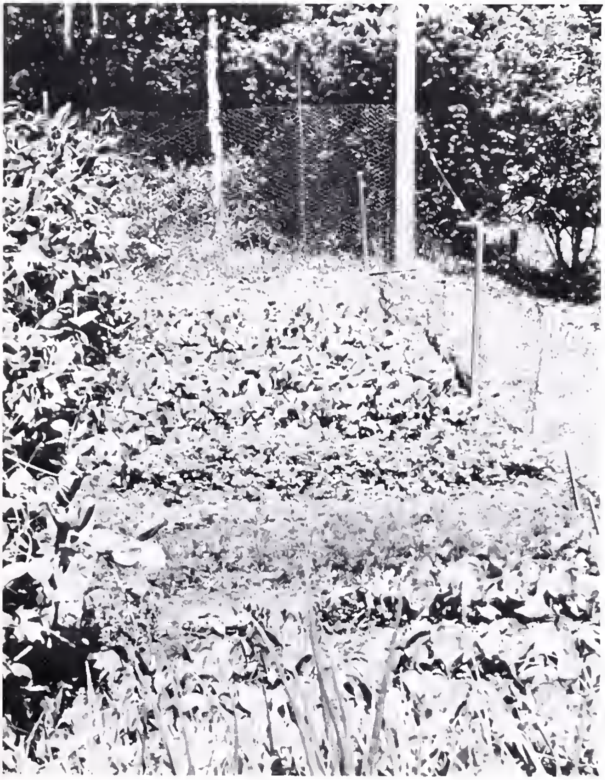
Garden or upland cress is a favorite with children because of its headlong rate of growth. It can be snipped or pulled within ten days of seed sowing. Cress can be grown in the garden or in pots on the windowsill. If soil is not available, cress will sprout on damp paper towels, blotting paper or old terry toweling, an added inducement to growing fresh greens indoors in winter.

Roquette (also known as rocket salad or arugula) is a member of the Mustard Family, long popular in the Mediterranean countries. Its long pointed leaves are gathered for mixed salads to which it imparts a peppery flavor, quite distinct from lettuce. Plants, grown from seeds sown in early spring, mature quickly and the leaves can be cut up to the arrival of

Joseph Harris Co., Inc.

Swiss chard is an old standby among summer greens, thriving on heat. It is ornamental enough to be planted in groups among flowers. Rhubarb chard has red stems.

Marjorie J. Dietz



Left: This home garden, enclosed by chicken wire to discourage rabbits, contains various kinds of salad vegetables. Peas are at the left. Later the space will be devoted to snap beans and tomatoes.

GREENS AND SALAD VEGETABLES PLANTING CHART

Vegetable	*Planting Times**	*Weeks from Seeding to Transplanting*	*Depth to Plant (inches)*	*Amount of Seed*	*Days to Maturity*	*Planting Distance (inches)* In Rows after Thinning	*Planting Distance (inches)* Between Rows	*Row Length (feet)*	*Estimated Production*
Beets	Mar.-Apr., June		½-1	¼-ounce	40-45	1	18-24	15	6 pounds
Celery	Apr.-May	10-12	(plants)	30 plants	100-125	4-8	30-36	15	30 stalks
Collards	April	4-6	½	½ pkt.	75	6-8	24-30	25	20 pounds
Endive	Mar.-Apr., June, July		½	10 plants	85-98	8-12	12-18	6	10 heads
Kale	July		½-1	6 plants	55	8-15	18-24	6	6 heads
Lettuce (leaf)	Mar.-Apr., July		¼-½	1 pkt.	45-50	6-12	6-12	5	2½ pds.
Mustard	April, July		½	¼ pkt.	35-45	1	18-24	10	5 pounds
Parsley	March		¼-½	⅛ pkt.	75-85	6	12-18	3 plants	3 bunches
Spinach	Mar.-Apr., July		¼-½	⅛ ounce	46-70	3-6	12-18	10	5 pounds
Swiss Chard	April		½	¼ pkt.	60	6-8	18-24	8	7 pounds
Turnips	July		½-1	⅛ pkt.	45	2-4	18-24	20	10 pounds

Oakleaf Lettuce

Upland Cress

Collards

warm weather. Then the plants begin to flower and form seed and become too tough and "hot." A sowing can be made in late summer for fall harvest, or the old plants from spring-sown seed can be cut back in summer. The resulting growth is usually palatable, especially if the season is cool and moist.

Corn salad is an old favorite among salad greens. It is a hardy plant. Seeds can be sown in spring and the leaves harvested during the summer, but the best results are obtained when seeds are sown in the fall and plants are harvested in the following spring.

Greens for Cooking

Beet and turnip greens: Seeds are sown rather thickly when the plants are grown only for their leaves. Seed catalogs usually specify which varieties are especially desirable for use as greens.

Spinach is a cool weather vegetable to be planted in early spring, then two weeks later, and again in July for a fall crop.

Collards are little known except in the South. They look like a non-heading cabbage or sproutless brussels sprout plant, taste like mild cabbage and are harvested either by cutting outer leaves before they grow coarse or by pinching out the central rosette of young leaves. Collards are a cool season vegetable which improves in flavor after a touch of frost.

Kale grows best as a fall crop and can stand considerable cold. It can be used until early winter in the North if protected by straw. Light frosts may improve the flavor. To harvest, cut outer leaves or the entire plant.

Summer Greens

New Zealand spinach, a spinach in common name only, can grow in hot weather, a tolerance it shares with Swiss chard. As with any unfamiliar vegetable, it is wise to plant only a small amount at first.

Swiss chard is a form of beet developed for its edible foliage. It will supply excellent greens during the summer when spinach is unable to thrive. If you keep the outer leaves cut, the plants will continue to produce high quality greens until frost. Leaves of chard are cooked like spinach and the stems used like asparagus. Rhubarb chard, with brilliant crimson stems and red-veined leaves, is especially attractive both on the table and as an ornament in the garden.

Mulches

One final note about mulches around greens and salad plants: Avoid using black plastic, except for Swiss chard and New Zealand spinach, because the plastic will result in a warmer soil that is apt to inhibit their best growth. ◆

Among the most popular of home-garden vegetables is this related trio

TOMATO, EGGPLANT AND PEPPER

B. L. Pollack

THE TOMATO is a member of the Nightshade Family (Solanaceae) and is related to such diverse plants as potato, eggplant, tobacco, bella-donna and petunia. It is a native of tropical America and was cultivated by the Indians from Mexico to Peru before the Spanish conquest. The development of modern American varieties began in 1870.

Tomatoes are warm-season plants and susceptible to frost injury. They should not be planted until after the average date of the last killing frost. For best development, tomatoes require a well-drained loose soil with a pH between 5.8 and 6.4. Because of a large root system and strong feeding habit, the plants must have adequate fertilization. Approximately 2 pounds of a 5-10-5, 5-10-10, or 6-10-4 fertilizer and 5 pounds of ground limestone for each 100 square feet of garden space should be applied during soil preparation. Late varieties respond to an additional feeding after fruit has been set on the first four or five clusters. Tomato plants require a site that receives direct sunlight all day.

Varieties

Many varieties are listed in seed catalogs. Select ones which are resistant to verticillium and fusarium wilts (varieties designated by VF or F in the list below). Early-maturing types will produce the first ripe fruit but bear for only a short period, so mid- or late-season types should be added to extend the harvest. Some suggested varieties are:

Early (60-70 days)—'Pixie' (VF), 'Small Fry' (VF)

Helen S. Witty

A harvest of 'Big Boy' tomatoes: why so many home gardeners grow tomatoes.

Second Early (70-75 days)—'Spring Giant' (VF), 'Jet Star' (VF), 'Heinz 1350' (VF), 'C1327' (VF)
Midseason (75-80 days)—'Ace 55' (VF), 'Supersonic' (VF), 'Ramapo' (VF), 'Better Boy' (VF)
Late—'Big Boy,' 'Rutgers,' 'Manapal,' (F)

For varieties especially recommended for your area, consult your county agricultural agent.

Plant Growing

Most home gardeners buy started plants, but new materials and techniques now make it possible for the home gardener to grow good transplants indoors. The elimination of soil from the procedure helps reduce loss from damping-off disease and does away with soil sterilization.

The time to sow indoors depends upon average date of last killing spring frost and size of transplants desired. In central New Jersey only six to eight weeks are considered necessary to grow excellent tomato plants.

Seeds need moisture, sunlight and warm temperatures for germination and early growth. A moist growing medium, well drained and well aerated, plus a temperature between 75° F and 85° F allows germination in seven to ten days.

Excellent germinating and growing materials are available at most garden supply centers. They include vermiculite and such soilless mixes as Jiffy Mix, Pro-Mix, and Redi-earth which contain vermiculite and peat moss with a fertilizer added.

Among plant-growing containers are various kinds of fiber pots (Pep, Jiffy, Pullen, Jack, Eriu, Ferto, etc.) made from peat or other fibrous material. These must be filled with soilless mix. At planting time, both pot and plant are set out.

There are also small fiber flats and numerous kinds of plastic flats and pots. Plastic containers must have holes for drainage and unlike fiber can be used over and over again.

Plant the seeds no deeper than ½ inch. The plant-growing material must be thoroughly wet before seeding. Cover seeds with the same material and water lightly. Cover container with a newspaper or slip container into a plastic bag. Hold at a temperature of 75° until seedlings

U.S.D.A. Photo

Many indoor aids for starting tender plants, such as tomatoes, now exist for the home gardener. Shown here are fiber plant trays and pots and soilless mixes.

Jiffy-7 Pellets, one of the more dramatic advances for indoor seed sowing, after being soaked, expand rapidly from their original flat, disk-like forms into the fiber pots shown here. Seeds are then pressed into the fiber which contains fertilizer.

Tomato plant in a Jiffy-7 Pellet ready to be set out in the vegetable garden.

emerge. No watering is necessary until after germination.

When seedlings emerge, remove the newspaper or plastic bag and keep them in full sunlight. Plants require about twelve hours of light per day. Supplement natural daylight with light from a 40-watt fluorescent tube to make the twelve hours of light. The tube should be about 1 inch above the tops of the plants. Raise tube as the plants get taller. Water as often as necessary, but don't keep the planting medium water-soaked.

After the first true leaf is formed, seedlings grown in vermiculite are ready to "prick out" into a container filled with a soilless mix. Dig the seedling carefully so as not to damage the root system. Make a small hole in the mix and set the seedling in it so that the seed leaves are ½ inch from the surface. Press the mix firmly around the roots and stem, then water. Tomato plants do best in 3-inch containers.

From emergence to one week before setting in the garden, the plants should be kept at temperatures between 70° to 75° F during the day and 60° to 65° F during the night. Twelve hours of light are still required for good growth. Also, apply small amounts of water at frequent intervals, but avoid soaking the plants. On cloudy days, reduce the amount of water.

One week before planting in the garden the plants should be placed outdoors and allowed to harden-off. During this period the plant should be protected from wind damage, but will be subjected to low, but not freezing, temperatures. Cut down a little on the watering, but be sure the plants are in direct sunlight. The hardening-off process takes about a week.

Transplanting

A good tomato plant for transplanting is about 8 inches tall, has a thick stocky stem, is light green in color, and has a well-developed root system.

Tomato seedlings or plants are very sensitive to frost and should not be planted in the garden until danger of frost is over. The frost-free date will vary from region to region and can usually be determined through your county agent. Early plantings can be protected by covers such as Hotkaps, but such plants will generally be poorer than those planted later in warmer soil.

When transplanting, it is not necessary to remove peat or paper containers. Of course, if clay or plastic containers are used, the plants must be knocked out of the pots before transplanting. The plants can be set in the garden to a depth just below the first leaves. If the plants are tall and thin, they can be planted even deeper.

After setting the plant, press the soil firmly around the roots, but leave a slight depression to hold water. Pour about one pint of a water-fertilizer solution (easily made by adding 2 tablespoons of 5-10-5 fertilizer to one gallon of water) around each plant.

Most of the early-bearing, small-fruited varieties, which are prized for their concentrated fruit yield, can be planted close together, with a minimum of 3 square feet per plant. It is neither necessary nor desirable to stake these varieties, but a mulch (see below) will keep the fruits clean.

The majority of large-fruited tomato varieties, which bear their fruit over the entire growing season, are large, spreading plants. When grown flat on the ground, they require a growing area of 6 to 9 square feet. However, when staked and pruned to no more than three stems, the plants can be grown in as little as 3 square feet of area.

U.S.D.A. Photo

Seeds have been sown in a fiber tray filled with vermiculite. Final step is to insert tray in polyethylene bag.

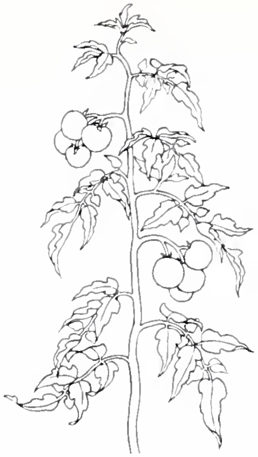
Staking and Training

To conserve space and improve fruit quality, it is desirable to stake and prune most tomato plants. Space the plants 18 inches apart in the row, training them to a double stem and tying to a stake support. The stake should be about ¾ of an inch in diameter, 4 or 5 feet long, and driven 8 to 12 inches into the ground. After planting, allow the main stem and the side shoot that occurs just below the first blossom cluster to continue growing. Break off all other side shoots or suckers that start sprouting in the leaf axils on each stem.

Tie the plants to the stake with soft twine or strips of cloth, making the wrap twice around the stake and once around the stem. Repeat the procedure 4 or 5 times during the season.

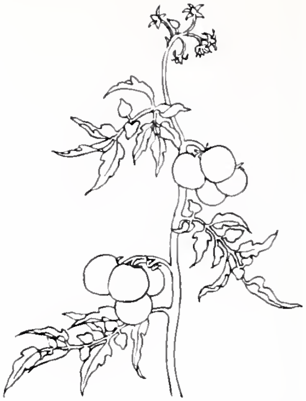
Cultivation, Mulching and Watering

It is important to remember when watering and cultivating that the roots of the tomato plant are shallow and wide-



Eva Melady

INDETERMINATE TOMATO—Terminal bud is vegetative and continues to grow, and the plant is capable of continuing growth indefinitely. Normally, a blossom cluster is produced at every third internode and is separated by three leaves.



DETERMINATE TOMATO (Also known as self-topping or bush tomato)—The terminal bud is reproductive and ends stem growth. There are less than three leaves between the flowering cluster. Generally, there are two leaves, sometimes one, occasionally no leaves at all between one flower cluster and the next. The stem eventually terminates in a blossom cluster, thus giving it the self-topping habit. All patio tomato varieties are determinate as are many standard varieties for home gardeners and commercial growers alike.

spreading. Cultivation that is too deep will destroy plant roots. In times of drought, watering is necessary to keep the surface roots from burning. Damage to roots will cause wilting, poor fruit set and size, and in many cases, blossom-end rot.

Mulching the plants with straw, hay or black polyethylene will reduce water loss and control weeds. When using the black poly plastic, all fertilizer must be in place before the plastic is applied. Plants or seed should be planted in holes pierced through the plastic after it is in place. Organic mulches, such as straw or hay, should be at least 2 inches deep on the soil and should be applied after transplanting.

In heavy soils, tomatoes need about 1 inch of water per week. In light, sandy soils, 2 inches per week are necessary. Heavy soakings at weekly intervals are better than many light sprinklings. When watering, cover the entire garden area, not just around the plant because tomato roots spread out for 10 or 20 feet.

Feeding

The initial application of fertilizer should be supplemented with a high-nitrogen fertilizer (12-6-4) after the first fruits are the size of a half-dollar. This should be applied at the rate of 1 tablespoon per plant and placed 8 or 10 inches from the stem. If possible, mix the fertilizer in the top inch of soil and water thoroughly. Plants that are mulched with black poly plastic will not need a sidedressing.

Disease Control

Diseases and other troubles of tomatoes may be divided into two major groups—

those which can and those which cannot be controlled with a fungicide spray or dust.

Many tomato pests live through the winter on tomato plant debris. For this reason, it is best not to plant tomatoes in the same area year after year.

Fungicides will control the following:

Early Blight—Brown spots with a target pattern up to ½ inch in diameter, which start on older leaves.

Late Blight—Dark, irregular, water-soaked areas on leaves and stems. In damp weather, a white moldy growth may be on the spots. Irregular gray to black areas may cover up to one-half of the surface of green or ripe tomatoes. The spots are very firm and rough, even on ripe fruit.

Anthracnose—Spots, on ripe fruit only, are circular, slightly sunken, brown and up to one-half inch in diameter.

Start your fungicide spraying or dusting program six weeks after setting out plants or about thirty days after the first blossoms appear. Spray at ten-day intervals, using 4 tablespoons of 70 percent Zineb or 5 tablespoons of 70 percent Maneb in 2½ gallons of water, or use a general-purpose vegetable-spray preparation according to the manufacturer's recommendation. If you use dust, apply it at seven day intervals, using a 4-5 percent Zineb or Maneb dust or general-purpose-vegetable dust.

Fungicides will not control:

Fusarium Wilt—Lower leaves turn yellow and wilt; later, the entire plant can die. Peel back the "bark" on the lower portion of the stem, and you will find brown streaks in the inner "wood." The streaks extend from the root crown up through the branches. Do not grow tomatoes in Fusarium wilt-infested areas for

Gardeners Have Many Ways with Tomatoes

SO delicious is the fruit of the tomato and so intriguing is its culture that home gardeners of every degree of skill and dedication aspire to grow it. Plants can be seen in city backyards, in pots or planters on rooftops or apartment terraces and in suburban or country or vacation-home gardens. The most flavorful tomatoes I ever tasted came from a half-dozen plants grown in deep wooden grocery boxes (painted green) on a mid-Manhattan apartment-house roof. The tomato plants and the soil for the boxes came from a city florist shop. The plants were fed casually—but quite often—with a fish-emulsion fertilizer, which, combined with a summer of abundant, sunshine, seemed to impart a memorable quality to the fruits.

City gardeners can grow tomato plants in tubs, planters or pots, the major requisites being as sunny a location as possible, protected from strong winds, sufficient water to prevent the soil from drying out (the soil in smaller tubs and pots dries out faster than in large containers) and occasional feeding.

Suburban gardeners, often as handicapped by lack of suitable garden space as city gardeners, find a place for a few tomato plants in a shrubbery bay, against a sunny wall or fence, next to a house or garage, among annual or perennial flowering plants, or in containers on a terrace or patio. While many gardeners with ample space enjoy the rituals of elaborate culture, with flawless fruits the result, others are content to purchase a few plants (six plants are sufficient for a family of four) and set them out in soil enriched by a handful of 5-10-5 fertilizer per plant. The addition of humus-forming materials, such as peat moss, leafmold or whatever is at hand, improves most soils, especially sandy ones. For more information on tomatoes in pots, see page 21.

—*Marjorie J. Dietz*

three years, or, plant resistant varieties. (See variety list above).

Blossom-end Rot—The blossom end (opposite end from the stem) of tomato fruit of all ages may turn black and become sunken. This usually occurs during a drought or when soil becomes too dry, especially if plants have been growing vigorously. To avoid blossom-end rot, try to maintain constant moisture in the soil and a pH of 5.8 to 6.5.

Leaf Curl—Almost all tomato plants show leaf curl on lower leaves during hot, dry conditions. This is normal and does not hurt plants.

Leaf Curl and Wet Feet—During and after a prolonged wet period, even on well-drained soils, the leaves may roll up until the opposite margins of leaflets touch. If plants are growing in poorly drained soil, a flooding with standing water may result in rapid death of plants. Do not plant in low or poorly drained area.

Walnut Toxicity—If roots of a walnut tree penetrate your garden soil, tomatoes, potatoes, eggplants, bush fruits, and several other plants may be killed. Also, loss of such plants may persist for years after the walnut tree is cut down.

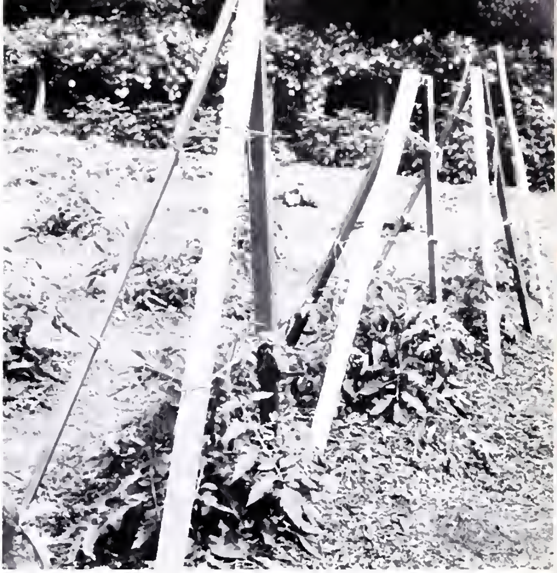
Weed-killer Injury—Even the slightest amount of a hormone-type weed killer, such as 2,4-D or 2, 4, 5-T, used in the vicinity of tomato plants, can result in curled leaves with light-colored veins. If a weed killer is used close to the garden or is used when prevailing winds carry it to tomato plants, abnormal growth, such as hair-like leaves, can occur. Also, leaf stems can grow into complete loops.

Virus Diseases—Various virus diseases may cause pale green or yellow streaks or blotches on foliage or fruit. Others may cause black streaks on the stem at the top of the plant and black streaks or yellow target-like areas on ripe fruit. Virus diseases of the tomato cannot live in the soil, but some of them are carried in tobacco and other materials. Therefore, tomato growers, especially those who smoke, should wash their hands with soap and water before handling tomato plants.

Roche

Left: A home gardener harvesting his potato crop. While few gardeners today have space in which to grow a winter's supply of potatoes, many can still enjoy the special taste treat of small "new" potatoes by growing a few plants. R. Milton Carleton in *Vegetables for Today's Gardens* (D. Van Nostrand Co., Inc., 1967) recommends "the lazy man's potato patch." Seed potatoes are planted, about a foot apart, on prepared soil and covered with 18 inches of straw—kept moist. The small potatoes are harvested in about 10 weeks by simply lifting the straw.

Roche



Marjorie J. Dietz

One man's way of staking tomato plants: the "tepee" method. The stakes are laced together with twine which confines the main stems within the tepee.

EGGPLANT

Eggplant is a long-season tender vegetable with cultural requirements similar to those of the tomato. The plants perform best on well-drained soils that are adequately fertilized and watered. The eggplant is a heavy feeder and requires about 2½ to 3 pounds of a 5-10-5 or 5-10-10 fertilizer for 100 square feet of garden space.

Varieties

Several varieties and hybrids are available to the home gardener. 'Jersey King Hybrid' is an early type with elongated fruits of rather light purple color. 'Black Magic Hybrid' has very dark glossy fruits which are oval in shape. 'Harris Special Highbush' has elongated oval fruits borne on plants that are tall and upright, keeping the fruits well off the ground. All varieties require a growing season of seventy-five to eighty days to produce mature fruit. Eggplant seedlings can be grown in 2-inch or even smaller containers before being set in the garden.

Transplanting

Eggplant is ready for transplanting about eight to ten weeks after seeding. Plants should be spaced about 3 feet apart each way in soil that has had ample time to become warm. For best results it is advisable to wait two to three weeks after danger of frost before planting in the garden.

Weed Control and Watering

The eggplant has a deep root system and can be cultivated deeper than tomatoes or peppers. Black poly-plastic mulch is recommended to control weeds, conserve moisture and provide ideal growing conditions for high yields. The eggplant requires about 1 to 2 inches of water per week applied in a single watering.

Harvesting

Fruits from the eggplant must be used while still highly glossy on the outside. As soon as the outside begins to dull, the seeds turn black and the flavor becomes bitter. The plants will grow until frost if kept well fertilized, supplied with an abundance of moisture, and if fruits are harvested promptly when mature.

Insects and Disease

Flea beetles, aphids and mites are pests on this plant and must be controlled (see

Marjorie J. Dietz

Mulching pepper plants with seaweed, freshly gathered from a local beach.

page 82) for satisfactory yields and fruit quality. Verticillium wilt is a serious disease in eggplant and cannot be controlled with fungicides. For this reason, plants should be grown in a new location in the garden each year.

PEPPERS

Peppers are also warm-season plants which make best growth at temperatures between 70° F and 75° F. They are sensitive to temperature extremes. Poor fruit set and blossom drop can be expected when night temperatures drop below 60° F or day temperatures rise above 85° F.

Varieties

Best results can be obtained with mosaic-resistant varieties, such as 'Staddon's Select,' 'Yolo Wonder' and 'Keystone Resistant Giant.' They all produce large, deep, thick-walled and blocky fruits. 'Cubanelle' is an excellent thin-walled frying type. 'Hungarian Wax' and 'Red Cherry' are hot types.

Transplanting

Pepper transplants are ready for the garden eight to ten weeks after seeding. A short, stocky plant grown in some type of container makes the most desirable transplant. Seedlings can be grown indoors in 2-inch containers. Peppers should not be planted until the soil has warmed up and all danger of frost is over. Spacing in the garden should be 2 feet by 3 feet.

Peppers are very similar to eggplant and tomatoes in their cultural requirements and can be treated in exactly the same manner.

Harvesting

Most garden peppers are harvested in the immature or green stage. Allowing the peppers to ripen or turn red on the plant before harvesting will improve their appearance and quality.

Insects and Disease

Flea beetles and aphids are serious pests and must be controlled (see page 82) for best results. Mosaic is a serious disease problem but can be controlled by growing resistant varieties. ◆

Pelleted or Coated Seed

PELLETED SEED is seed that has been coated with powdered vermiculite dust, clay, or some other inert material in order to increase its size for ease in handling. The coating gives the seeds a uniform spherical shape. It is used mostly on small seeds such as those of lettuce, carrot, celery, parsley, onion, pepper and tomato. The main advantage of pelleted seed is that it lends itself to precision planting, whether by machine or by hand. It is primarily used in commercial vegetable production, as it reduces the amount of seed required and eliminates some of the labor involved in thinning the crop.—*Joseph M. Lent*

When you plan your vegetable garden, it is important to look beyond the first planting in early spring

SUMMER CARE OF THE VEGETABLE GARDEN

Orrin Turnquist

IF you aim at a continuous supply of high quality vegetables throughout the summer, you should learn to keep every foot of your plot at work. After fast-growing crops such as peas have been harvested, their rows can be used for sowings of lettuce, spinach, radishes, turnips and kohlrabi. Late-planted cauliflower, broccoli and Chinese cabbage, which mature in autumn when weather has turned cool, are often of better quality than those grown in the heat of summer. Another way to extend your harvest is to make small but frequent plantings of beans, corn and salad greens.

Before making a sucession planting, it is necessary to replace the soil nutrients used by the previous crop. A complete fertilizer such as 10-10-10 should be applied at the rate of 1 pound per 25 feet of row. With the corner of a hoe, make a furrow on each side of the row about 3 inches from its center, and divide the recommended amount of fertilizer between the two furrows.

Late-sown seeds must be protected against drying out in hot weather. A thin mulch of finely chopped straw or grass clippings scattered over the row will help keep the soil moist and promote germination.

Thinning

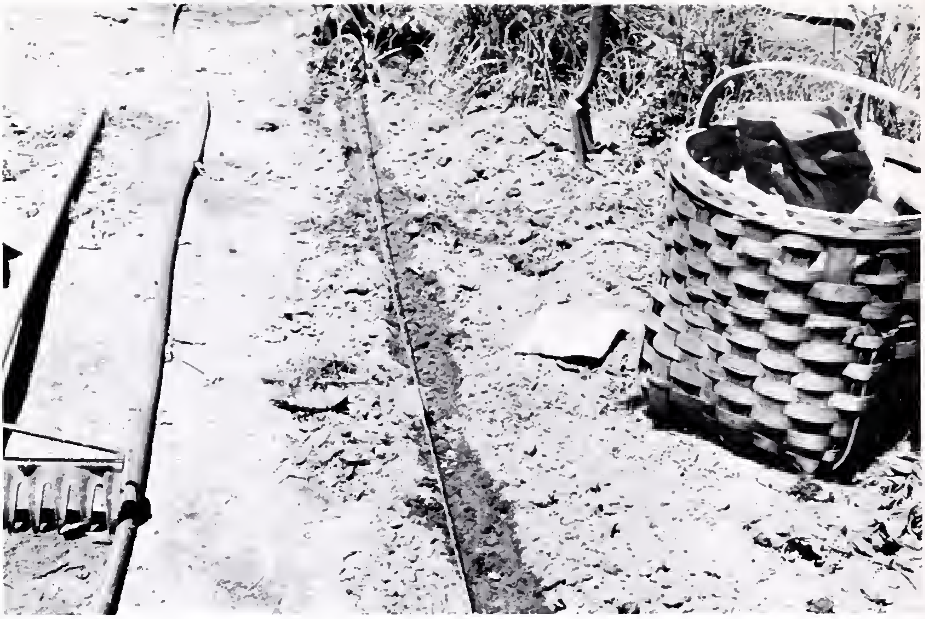
A weed is nothing but a plant out of place. If you have 15 carrot plants coming up in one inch of row, 14 of them are weeds and only one will form a good carrot root. Small seeds are difficult to sow thinly enough to permit all the plants to develop, so thinning is generally necessary. Thinning is best done soon after the seeds germinate and when the soil is moist. At this time, surplus plants can easily be removed without injury to the remaining plants. Sometimes the tops of surplus plants, like beets and turnips, can be enjoyed as greens. Thinnings of lettuce and chard can also be used as food. Often radish and onion seedlings are left in the ground until the ones to be thinned are large enough to eat.

Cultivation

Weeds compete with desirable plants for water, nutrients, light and air. Hand cultivation will keep weeds under control but must be done frequently enough to wipe out weed seedlings while they are still small. Deep cultivation often will bring weed seeds to the surface where they will grow and add to the problem of competition. Deep cultivation often causes root pruning of the vegetable plants and in the case of tomatoes may result in blossom-end rot.

Mulches

Many gardeners turn to mulches to eliminate the labor of weeding and at the same time benefit their plants. A mulch smothers weed seedlings, equalizes soil temperature, conserves moisture, prevents erosion and keeps low-growing vegetables such as squash, eggplant, bush beans and leafy crops from touching the soil or being splattered with mud in heavy rains. Organic materials used as mulches include leaves, hay, straw, ground corncobs, buckwheat and peanut hulls, sawdust, pine needles and wood chips. Avoid sawdust or



The hose should be near at hand in the summer vegetable garden. Seed germination is speeded if the furrow is soaked—as has been done with this row of beans.

chips from black walnuts and butternuts as these contain material toxic to many plants.

Organic mulches should be placed on the soil after the plants are well established, that is, usually after the first cultivation. Coarse materials such as leaves are applied from 3 to 4 inches deep, while a 2-inch layer of sawdust or other fine-textured material is sufficient. These organic mulches will decompose and ultimately be incorporated into the soil to increase its humus content. The microorganisms that break down organic material draw a considerable amount of nitrogen from the soil in the process. To avoid a nitrogen deficiency, extra nitrogen is often added with the mulch.

Recently, synthetic materials, chiefly plastic—black or clear—have been employed to reduce labor and improve warm-season crops. Black plastic prevents the growth of weeds by depriving them of light. Clear plastic admits light and warms the soil for early crops, but an herbicide must be used before the plastic is laid down as weeds will thrive under its shelter.

All fertilizer needed for the growing season must be applied before the plastic is laid down. As the plastic is unrolled over the prepared seedbed, its edges are anchored in a 2-inch furrow and covered with soil. Either the vegetable seeds or transplants are planted through holes cut in the plastic at the desired intervals. Random slits cut in the plastic allow water—rain or irrigation—to reach the soil.

Black plastic has been useful in promoting earlier warm-season vegetables in the North, especially with vine crops, tomatoes, eggplants and peppers. There is less blossom-end rot in tomatoes where the black plastic has been used as a mulch.

Slugs are often a problem where mulches are used. These are small snail-like creatures that feed on vegetation, rasping off tender tissues and leaving holes or skeletonized areas and a tell-tale ribbon of slime. They may be killed with baits containing metaldehyde. Slugs are apt to hide in damp, dark places and will congregate under pieces of wood laid on the ground. They can then be crushed or picked off and dropped into a can of salty water. It is reported that if saucers are filled with beer and set into the ground, slugs will crawl into them and drown.

Although several selective chemicals have been developed for controlling weeds in vegetable crops, their use by the home gardener is not generally practical. A new material called dacthal is now available in small package form for weed control in several vegetable crops. Follow directions on the label carefully.

Where quackgrass is a problem, a fall application of dalapon will be helpful. Follow directions on the package.

Watering

Water transports minerals from the soil to the leaves of plants and also is an essential raw material in the manufacture of food. When rain fails to provide a constant supply of moisture, artificial watering will be needed. The soil should be soaked to a depth of 6 to 8 inches, a sufficient quantity to last a week to ten days. Use a sprinkler or porous canvas hose, or remove the hose nozzle and let water run onto a stone or board to prevent washing out a gully.

Supports

Some vegetables such as tomatoes and vine crops can be allowed to sprawl but will take less garden space if trained to a stake or fence. Directions for staking and pruning tomatoes will be found on page 39. Other tall-growing vegetables require support for growing. Pole beans can be supported on poles arranged in tepee fashion or on trellises. To make a trellis, drive stakes every 10 to 12 feet in the row. Stretch wire between the stakes at top and bottom, then weave string between the wires to support the plants.

Specific Care

Brussels sprouts are buds formed in the axils of the leaves along the main stem. As buds develop on the lengthening stem, break off the lower leaves to give the sprouts more growing room. Faster and better growth of these lateral sprouts will result if the terminal bud at the top of the plant is removed in midsummer.

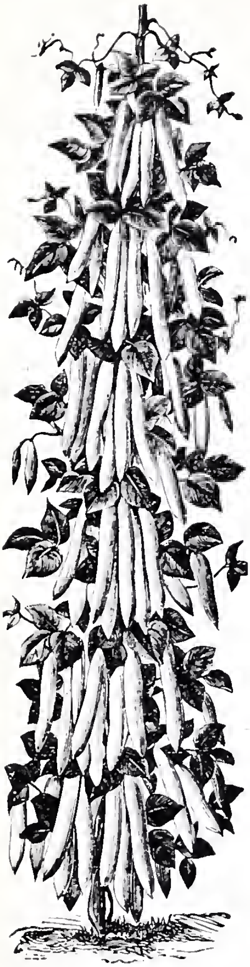
Marjorie J. Dietz

A hay or straw mulch will prevent the growth of weeds and conserve moisture.

Cauliflower heads turn yellow or green when exposed to sunlight. Blanching is necessary to produce white heads of good quality. Until the heads are 2 or 3 inches in diameter, the leaves cup over the heads and shut out sunlight. As the head grows, it pushes the leaves apart so that light gets in and colors the curds or head. To prevent this, you can lap the leaves over the head and secure them with string or toothpicks.

Golden or yellow celery varieties also require blanching. A bank of soil between boards along each side of the row will keep light from reaching the stalks. Green or Pascal celery, which is not blanched, is easier for the home gardener to grow and contains more food value and vitamins.

Tomato plants may drop their first blossoms when night temperatures fall below 60°. Hormone sprays are available to cause fruit to set even when flowers have not been pollinated. The spray is applied to the first two or three blossom clusters that appear. Keep the spray off young leaves or growing tips as they may be injured. ◆



LARGE GARDEN PLAN. No one planting scheme or selection o all conditions and tastes. This 70- by 150-foot garden can individual preferences. A garden of this size should produce vegetables for a family of five. In the plan, rows are spaced If a tractor and tractor-drawn tools are used, wider spacing wi sary. Since the plot is spacious, succession and companion plant

1
4'
Asparagus—rhubarb—chives—horseradish—herbs—winter on
4'

2
Onion sets to mature—thinnings used for green onions (Apri
2½'
Onion seed to mature—thinnings used for green onions (Apr
2½'
Early spinach—lettuce—turnips—cress—kohlrabi (April). F
2½'
Early peas (April). Followed by beets and late carrots (Jun
2½'
Second early peas (April). Followed by late celery—cauliflow
2½'
Late peas (April). Followed by late endive—Chinese cabbag
2½'
Early beets—early carrots (April). Followed by late spinach
2½'
Early cabbage—broccoli—cauliflower (April). Followed by
2½'
Parsnips—salsify—Swiss chard—New Zealand spinach—pars
2½'

3
Cabbage—Brussel sprouts—early celery (May)
2½'
Second plantings of beets—carrots—kohlrabi—lettuce (May)
4'
Cucumbers—muskmelons—summer pumpkins—winter squas
4'
Sweet corn
2½'
Sweet corn (May 1) (May 20) (June 15) (July 1)
2½'
Sweet corn
2½'
Snap beans (May 1-15)
2½'
Green shell beans—dry shell beans (May 20)
2½'
Lima beans (May 20)
2½'
Lima beans (May 20)
4'
Tomatoes—sweet and sharp peppers—eggplant (May 20)
4'
Late cabbage (June 15)
2½'
Late cabbage (June 15)
2½'

Dates are for Central Pennsylvania.
Grouping shows:—1. Perennial crops. 2. Early maturing crops followed

° Distance between rows may depend upon type of cultivator to be us

bles can suit
ged to meet
ole supply of
d cultivation.
bly be neces-
not essential.

y snap beans (June 15-July1)

1)

coli (June 15-July 1)

e (July 1-15) or late turnips (July 15 to August 1)

beans (July 20)

r kale (July 15-August 1)

il) (Seeded with marker of early and second early radishes).

15)

ession crops. 3. Crops occupying the ground all season.

All vegetable woodcuts courtesy of R. H. Shumway Seedsman

Dual-purpose vegetables . . .

ORNAMENTAL VEGETABLES

Joseph M. Lent

THERE are a number of vegetables that are ornamental as well as good to eat. Such varieties can raise the artistic level of the vegetable plot or can be used for unusual effects among flowers. An example of one ornamental vegetable is the scarlet runner pole bean (see page 70). Another is 'Royalty,' a bush snapbean that matures in 51 days. It is very prolific and produces tender stringless pods of a deep purple color which are in pleasing contrast to the green foliage—thus making for easy picking. 'Royalty' lends itself well to home freezing and has a natural blanching indicator, as the pods turn green when boiled for two minutes.

Flowering cabbage is very decorative and has bright, contrasting leaf colors ranging from red, white, rose or pink against emerald green. It is prettier than many true flowers—and edible! It matures in about 55 days from time of setting out transplants and should receive the same culture as standard varieties.

Ornamental eggplant, dwarf in plant size, has typical eggplant foliage and bears lavender blossoms. Fruits are the size of small white eggs, turning golden yellow when mature.

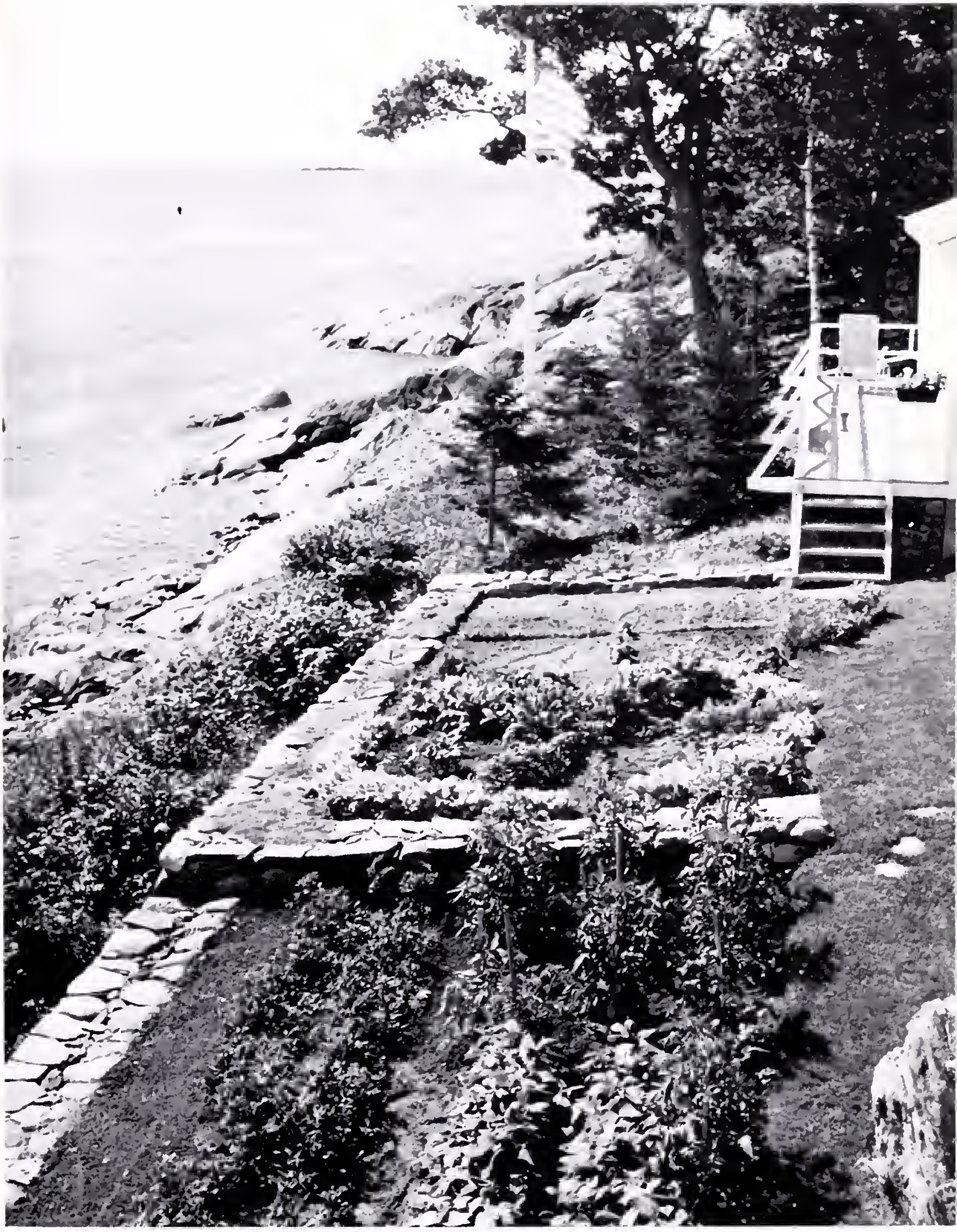
Flowering kale is a very colorful plant, quite similar to flowering cabbage. It is highly ornamental and makes a good container plant or a group of plants can be used as accents in the flower border.

There are several ornamental lettuce varieties. 'Salad Bowl' has many curled bright green leaves, is slow bolting and nonheading in habit. It matures in about 45 days. 'Red Salad Bowl' is identical to the green variety, but the leaves are red and of perhaps a little better quality. 'Deer Tongue' ('Matchless') is a crispy dark green variety of upright, compact habit. The leaves of unusual shape are oblong to triangular. In flavor, it is similar to Bibb head lettuce. 'Deer Tongue' is heat resistant and grows for a long time without bolting. 'Ruby' is a very attractive non-heading salad lettuce. The leaves are frilled, crisp and bright ruby red. It is easy to grow, matures in 47 days and is used as an ornamental or in salads.

'Bellboy Hybrid' pepper matures in 75 days. It produces blocky 4-lobed fruits

'Salad Bowl' lettuce, with its frilly, light green leaves, is decorative in the garden and in salads.

All-America Selections



George Taloumis

A seaside garden along the Maine coast. Lettuce and herb plants are arranged in a semi-circular pattern while beans and tomatoes in neat rows fill the lower section of the garden.

Marjorie J. Dietz

Vegetables planted to show the beauty of leaf shapes and textures at the Brooklyn Botanic Garden. In community garden plots and in many backyards, space restrictions necessitate closer planting of vegetables than is usually recommended.

that are deep green, turning early to red on an attractive strong, bushy plant. 'Golden California Wonder' pepper is similar but when the fruits are mature, they are a rich golden yellow color. The fruits can be eaten when green or when mature. The 'Sweet Yellow' or 'Banana' pepper is the largest, earliest and sweetest of the long yellow varieties. It matures in about 60 days. The fruit, banana-shaped, about 8 inches long and 2 inches in diameter, is light yellow in color but turns to bright red when mature. It makes a very attractive ornamental. 'Cherry Sweet' has small, dark green round fruits, about 1½ inches in diameter, which turn dark red when mature. All days to maturity for peppers are reckoned from the time of setting out transplants.

The swiss chard variety called 'Rhubarb' is a most attractive plant. It has crimson red stalks and veins, extending into the dark green crinkled leaves. The plants are upright in growth and attain a height of 20 to 24 inches. They make an excellent background for less glamorous vegetable plants.

Many tomato varieties are decorative and produce delicious fruits. The variety 'Small Fry' is an excellent hybrid cherry tomato and is ornamental and prolific when trained on a stake or trellis. Its fruits are one inch in diameter and intense crimson in color. 'Yellow Pear' and 'Yellow Plum' are also very decorative tomato plants with interesting fruits.

Red okra is an unusual and ornamental vegetable. It has rich red pods which grow prolifically on a bush of the same shade. The red pods can be used to decorate salads or they may be cooked (they then turn green in color) and put to traditional okra use. The bush itself makes a 5- to 6-foot colorful plant and the pods, if unpicked, finally turn a rich brown-black, making yet another handsome phase in this variety's growth cycle. The dried pods make attractive additions to winter bouquets. ◆

When you grow your own beans and peas, you will enjoy delicacies a non-gardening gourmet can only dream of

VEGETABLES IN A POD

Leslie Hafen and Donna Hoffman

THE garden requirements of the legumes—snapbeans, lima beans, peas, soybeans and pole beans—are determined by their need for warm or cool growing conditions.

Peas

Peas, a cool season crop, should be planted as soon as the ground can be worked in spring. Rows should be spaced 1½ to 2 feet apart, with seeds planted 1 to 1½ inches deep and 1 to 2 inches apart in the row. Tall-growing peas, which need brush or chickenwire to grow on, can be planted in double rows 6 inches apart, one on either side of the supports. These tall peas are often planted in 4-inch trenches and covered with 1½ inches of soil. As the plants grow taller, the trench is gradually filled in. By this means, roots are located in cool, moist earth and not exposed to surface heat and drying.

Peas require from 65 to 75 days from seed planting to harvest. They are most delicious when their pods are well filled but still bright green. When pods turn yellow, the peas are aged and starchy and, with the vines, should be consigned to the compost heap where they will decompose and make valuable humus for ultimate reuse in the garden. Pick the peas in the cool of the day and refrigerate until cooking time in order to arrest the conversion of sugar to starch. The sweetest varicites are those with wrinkled seeds. These are not as frost resistant as the smooth-seeded sorts.

Peas are ideally suited for colder parts of the country. They do not thrive where spring is short and summer comes quickly. In fact, the low yields or crop failure that some gardeners experience with this vegetable are very often caused by excessive heat. If in doubt about the successful cultivation of peas in your area, check with your county agent.

Edible-podded or Sugar Peas

These peas, familiar to all admirers of oriental cooking as snow peas, are grown the same way as regular peas. Because pod and all is eaten, they must be picked very young, when the peas are just perceptible in the pods. If they grow larger, the peas can be shelled and eaten like regular green peas but the pods will be too tough. The pods can be boiled briefly in a small amount of water, or stir-fried in a trace of cooking oil in the oriental manner.

Bush and Pole Beans

Both types, of which there are many varieties, are easy to grow. Pole beans require a trellis or other support and perhaps even the use of a stepladder for harvesting! In compensation, they yield more heavily and over a longer period than bush or snap beans which must be replanted every two or three weeks to keep the kitchen supplied over the summer.

Soil for beans should be moderately fertile, with rotted manure or other avail-

Helen S. Witty

VEGETABLES IN A POD—*Left to right:* The slender, tender "French" bean 'Triomphe de Farcy'; wax and green snapbeans; fava or broad bean, a European favorite which must be planted early, about the same time as peas.

able compost and fertilizer added when the ground is prepared for spring planting. However, too much nitrogen will produce huge plants but few beans. Keep the soil moist but not wet for a few days after planting.

In making your garden plan, allow a space of 2 to 2½ feet between rows for beans. Seeds should be planted 1 to 1½ inches deep and 2 inches apart. A pound of seed will plant a 100-foot row and yield approximately one-half bushel.

Bush snapbeans can usually be harvested within 50 to 60 days after sowing and should continue to bear for 10 to 20 days. For tender, delicious beans, pick when the pods are only half grown. If the beans are picked, the plants will continue to produce pods for a longer period. For a continuous harvest, plantings should be made 10 days apart.

If beans are picked while immature, both pod and beans are edible. When mature but still green, the beans can be shelled and cooked like peas. If pods become brittle, shell the beans and keep them for winter use.

Lima beans also come in bush and climbing varieties with about the same requirements noted for snapbeans. Plant-

Roche

Maintaining a mulch of marsh hay around bush snapbeans suppresses weeds.

ings should be made only when the ground is thoroughly warm and all danger of frost is past. Rows should be 2 to 2½ feet apart with seeds set 1 to 1½ inches deep. The seeds should be sown about 2 inches apart but later thinned to 4 inches for the small-seeded varieties and 4 to 6 inches for the large-seeded types. Limas do not produce well when they are crowded.

Lima beans require a long growing season, 75 to 95 days with high temperatures. The bush types and small-seeded varieties mature earlier than the pole and large-seeded limas and are therefore better suited to areas where the summer is short. Soil and fertilizer needs are the same as for snapbeans. Limas are most delicious when little larger than peas and are just as sweet, succulent and starch free.

Soybeans

Soybeans are becoming popular as home garden vegetables. They are grown like bush or snapbeans and are just as easy. Their growing season is relatively long, 80 to 100 days, or approximately from June 1 to September 1. As with bush and lima beans, planting should be delayed until after the last possible frost and when the soil is warm to the touch.

Soybeans are picked when the pods are nearly full grown but before they begin to turn yellow. Shelling can be difficult but can be facilitated if the pods are placed in boiling water for a few minutes. A strip can then be easily cut off the seam side with scissors.

The Japanese method is to pick the green pods and drop them into boiling water. Boil them 15 to 20 minutes depending on whether you want them slightly resistant or very tender. Drain the cooked pods, sprinkle them with salt, then take them up one at a time, curved or seam side towards you, and squeeze the beans into your mouth. They are described as tasting midway between a lima bean and a pea and, because of their high oil content, need no butter. If beans dry on the vine, they can be shelled and used to produce bean sprouts as a fresh vegetable during the winter. ♦

Among the most hardy are those

VEGETABLES WITH EDIBLE ROOTS

William M. Brooks

THE vegetables grown for their edible roots are collectively known as the root crops. Included are beet, carrot, parsnip, salsify (vegetable-oyster), turnip, rutabaga (swede) and radish; all are similar in their cultural requirements. They are best adapted to cool temperatures.

When grown in the South, they are usually produced during the winter. Root crops, such as radishes and turnips, which require only a short growing period, do better in the spring and fall than during midsummer. The root crops are considered hardy and can be planted early in the spring and left in the garden until late in the fall. Seeds are nearly always sown where the crop is to mature. The only exception is the beet, seeds of which are sometimes sown in a hotbed or greenhouse to obtain a very early crop.

A deep, fertile soil, only slightly acid and well-drained yet supplied with continuous moisture is necessary. Soil that contains gravel or rocks or is very hard can result in forked or misshapen roots. If soil tests indicate a strongly acid condition, ground limestone should be added. To improve the soil texture and productivity of the vegetable, a cover crop or green manure (see page 60), crop residues, compost, peat moss or rotted animal manure should be added to the soil. (Do not use fresh or coarse manure just previous to planting.) These organic materials will not only add nutrients but will also improve the soil's structure, internal drainage and water-holding capacity. Chemical fertilizers can also be added to complement the organic material and provide adequate nutrients at a reasonable cost.

Beets

The garden beet is well adapted to all parts of the United States. It has fair tolerance to extremes of heat and cold. Best quality roots and leaves result when growth is continuous and unchecked. In addition to the soil and moisture requirements already described, cool temperatures are desirable.

Beets are sensitive to strongly acid soils: lime should be added if a soil test indicates the need. To supply adequate nutrients for beet growth, it is often desirable to add 2½ to 4 pounds of complete fertilizer to each 100 square feet of garden. This fertilizer should be broadcast and worked into the top 2 to 4 inches of soil before planting.

Where hand cultivation is to be practiced, rows can be 14 to 18 inches apart. If mechanical cultivators are to be used, the distance between rows should be increased to accommodate the equipment. Beet seed should be planted about 1 inch deep. After the plants are well established, they should be thinned to stand 2 to 3 inches apart in the row.

'Early Wonder' and 'Detroit Dark Red' are the standard red varieties. 'Golden' is an orange-fleshed beet which retains its color when cooked.

Very few diseases or insects attack beets. Boron deficiency in the soil can cause internal black spot. These hard or corky black spots are scattered throughout the root but are always found in the light-colored zones.

Beets are ready for harvest when the tops are large enough to be used for greens or the root is large enough for cooking.

Carrots

Carrots are well adapted to growing in most parts of the United States. The roots are rich in vitamin A and contain large amounts of thiamine and riboflavin. If carrots are exposed to temperatures of 40 to 50° F for fifteen days, they will produce seed stalks. Carrots with developing seed stalks have a bitter and undesirable flavor.

Seeds can be planted as soon as the chance of a hard freeze has passed in the spring, but seed stalk development can result if the temperatures remain in the range mentioned above. Since carrot seed is slow to germinate, radish seed is often mixed with it because the quick-germinating radishes will mark the row.

Carrot seed should be planted ¼ to ½ inch deep in rows 16 to 18 inches apart. There should be a space of 1 to 2 inches between carrot plants after they have been thinned. They are usually thinned when 2 or 3 inches tall.

Carrots are most productive when the pH of the soil is about 6.5. Lime should be added if needed to reduce acidity. The fertilizing of carrots is very similar to that of beets. Make sure the fertilizer is thoroughly mixed into the soil before planting. Bands or layers of fertilizer can result in deformed roots.

'Nantes,' 'Superstar' and 'Red Cored Chantenay' are standard varieties. 'Gold Pak' and other F_1 hybrids are becoming more plentiful and are being used in the home garden. Harvesting can begin as soon as the roots are large enough to eat.

Carrot yellows, a virus, is a disease of carrots which is transmitted by the six-spotted leaf hopper. Roots from infected plants have a bitter, astringent flavor. The larvae of the carrot rust fly sometimes cause injury to the root.

Parsnips and Salsify

Parsnips will grow over a wide portion of the United States. However, the seed is difficult to germinate during midsummer. Roots that mature during hot weather are of low quality. In many areas of the South, parsnips are grown so they will mature during spring and early summer.

Any well-drained, deep, fertile soil will grow parsnips but light, friable soil that does not tend to become crusted is best. The soil should be worked to a depth of a foot. Parsnips are not sensitive to high soil acidity. The soil should be enriched with 3 to 5 pounds of complete fertilizer to each 100 feet of row. Fertilizer should be thoroughly mixed with the soil before planting.

'Hollow Crown,' 'Model' and 'All American' are recommended varieties. Parsnip seed older than one year seldom retains its viability and therefore must be purchased fresh each season. Seeds should be planted in rows 20 to 24 inches apart, covered to a depth of ½ inch and later thinned to stand about 3 inches apart in the row.

Parsnips may be stored in a cellar or pit or left in the ground until used. Roots placed in cold storage gain in flavor faster than those left in the ground, but roots left in the ground in winter also improve in flavor.

There is no basis for the belief that parsnips that remain in the ground and start to grow in spring are poisonous. All reported cases of poisoning from eating so-called wild parsnips have been traced to water-hemlock (*Cicuta maculata*) which resembles parsnip and belongs to the same family. Great care should be exercised when gathering wild material for human consumption.

Salsify is a hardy vegetable which belongs to the composite family. It is commonly referred to as vegetable-oyster or

George Taloumis

This generous-sized garden divided by a gravel path contains a variety of vegetables including peas supported against chicken wire, onions, carrots and corn.

oysterplant because its taste is similar to that of cooked oysters. It requires a rather long growing season and should be planted early in the spring. Salsify should be stored in the same way as parsnips. In general, salsify is easy to grow and has no serious insect or disease enemies. Salsify has the same cultural requirements as parsnips but needs a rather low level of acidity.

'Mammoth Sandwich Island' is the variety listed in most seed catalogs. It has almost white or slightly yellowish skin. The seed should be planted in rows 16 to 20 inches apart, covered to a depth of ½ inch, and thinned to stand 3 to 4 inches apart in the row.

Turnips and Rutabagas

Turnips and rutabagas are among the most commonly grown and widely adaptable of root crops. The two are not identical nor are rutabagas always yellow-fleshed and turnips white-fleshed. Turnips have flattened roots, a distinct taproot, little or no neck and hairy, coarse, yellow-green leaves and leaf stems. There are both white- and yellow-fleshed varieties. Rutabagas have more elongated roots than turnips, with roots arising from the underside of the enlarged edible portion as well as from the taproot. The neck is prominent and the fleshy, hairless leaves are covered with a bloom that gives them a bluish appearance. Rutabagas are also called swede turnips or swedes and there are both white- and yellow-fleshed varieties.

Rutabagas and turnips are essentially cool-season vegetables. Commercial production of the roots in the northern part of the United States is centered mainly around their use during the fall and winter. However, turnip greens are a standard home garden vegetable in southern states. Both crops resist frost and mildly freezing temperatures. Turnips are grown both as a spring and fall crop since they mature in most localities in 60 to 80 days. Since rutabagas require a longer growing season, only one crop can be grown in the North each year. It is spring-planted and harvested late in the fall. Turnips are often sown in August in the North following the harvest of other vegetables. Unlike parsnips and salsify, rutabagas do not improve with freezing.

Turnips will grow in moderately acid soil but rutabagas do best in well-limed soil.

The rows for turnips should be 16 to 20 inches apart with seeds planted 2 to 3 inches apart. Rows for rutabagas should be 20 to 24 inches apart with seeds 4 to 6 inches apart. Seeds of both should be planted about ½ inch deep.

'Purple Top White Globe' and 'Just Right' are the most commonly grown white-fleshed turnips. 'American Purple Top' is the standard yellow-fleshed variety of rutabaga.

Such diseases as club root, white rust, scab, anthracnose and mosaic attack turnips and rutabagas. Aphids, flea beetles and cabbage maggot are troublesome insects.

Radishes

Radishes are the quickest of our vegetables to mature. It takes only 20 to 40 days for the mild type to reach edible size. The more pungent, large winter raddishes can be harvested in 75 days or more. Mild types remain in prime condition only a few days, so small plantings should be made at 7- to 10-day intervals. A few feet of row will supply all the radishes a family can eat during the peak harvest of each planting.

Radishes are hardy to cold but cannot withstand heat. In the southern states, they do well in autumn, winter and spring. In the North, they may be grown in spring and autumn. In areas with mild winters, they can be grown in cold frames during that season.

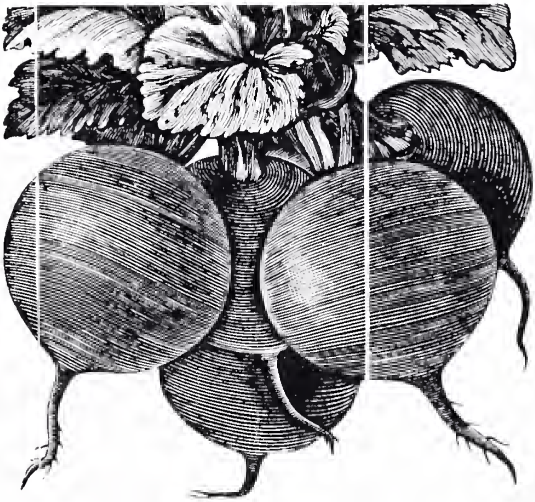
Radishes are not exacting about soil so long as it is rich, moist and well aerated. Broadcast and thoroughly mix into the soil's top 1 to 3 inches a complete fertilizer at the rate of 1 or 2 pounds for each 100 square feet before seeding. Sow seed about 1 inch apart in rows that are 12 to 18 inches apart. Cover seed about ½ inch deep.

The mild varieties that are most frequently grown are 'Early Scarlet Globe,' 'Red Prince' and 'French Breakfast.' The more pungent winter radish varieties that are most popular are 'Long Black Spanish' and 'Round Black Spanish.'

Diseases and insects that cause problems with turnips are also pests of radishes.

Storing of Root Crops

When storing roots, it should be remembered that they are living tissue. These roots breathe and respire, taking in oxygen and giving off carbon dioxide and water. The lower the temperature—as long as it stays above freezing—the slower these life processes will function and the longer the roots can be stored. ◆



Two perennial favorites—enduring in the garden and delectable on the table . . .

ASPARAGUS AND RHUBARB

W. B. Johnson

ASPARAGUS has been grown in the United States since the earliest settlements were established. It was not grown extensively by commercial growers until after 1850 or 1860. Rhubarb (or pieplant) is a native of Asia, popular in this country since the late eighteenth century.

ASPARAGUS

Asparagus is a hardy perennial that requires two years of growth before the first harvest. After that time harvests continue for 12 to 15 years or more—under good growing conditions. There are both male and female plants.

PLANTING LOCATION—Asparagus will grow in any well-drained soil, though it performs best in a deep, fertile sandy loam, preferably free from stones. The planting should be located to one side of the garden so that it will not interfere with yearly soil preparation for annual vegetables.

VARIETIES—Select a productive strain of the 'Washington' variety, which has good resistance to rust disease.

Well-grown one-year old crowns are used to plant the bed. The home gardener can buy crowns from a reliable commercial source and plant them as early in the spring as the soil can be worked without puddling.

SOIL PREPARATION—The soil should be tested to determine how much ground limestone and fertilizer to apply. Since asparagus is deep rooted, take soil samples from both the surface and subsoil; the pH should test 6.0-6.8. Your county agricultural extension service agent can advise you where to have your soil tested and after considering the results of the test, he can recommend the liming and fertilizer practices to follow.

A soil rich in humus is recommended for asparagus. One way to achieve the humus content is to plant a cover crop, such as rye grass (2-3 lbs. of seed per 1000 square feet), in the fall.

It is turned under before the crowns are planted. Lime and superphosphate may be plowed under with the cover crop if soil test results indicate the need in the subsoil.

PLANTING OF CROWNS—Crowns are planted in a trench which is dug or opened by filler to a depth of 6 to 8 inches. The bottom of the trench should be 12 inches wide. Single crowns are laid in the trench a foot apart with buds up. Take care not to step on the crowns or the shoot buds can be damaged. In sandy, light-textured soils, plant at the 8-inch depth; in heavy soils, the 6-inch depth is preferred. After the crowns are in place, cover them with no more than 2 inches of topsoil. Wait until plants are about 12 inches or so tall before starting to draw soil back into the row. By mid-summer, you will have finished the gradual covering of the crowns, and level cultivation can then be practiced. Covering too quickly results in poor growth or death of the plant.

The distance from one asparagus row to the next ideally should be 5 feet, but 24 to 48 inches between rows is sufficient in home gardens where space is limited.

CULTIVATION—During the first season the filling of the trench will serve to disrupt weed growth. Once the trench is filled, control weeds with shallow cultivation. Cultivating too deeply can damage the roots and buds on the crowns. As the

Gottscho-Schleisner

Roche

TWO PERENNIAL FAVORITES—Rhubarb *(above)* has such decorative foliage that it can be used as an ornamental accent in any number of garden situations. Asparagus stalks *(right)* as they appear in the spring—ready to be cut, and as soon as possible thereafter, served at the table.

plant grows and develops a more extensive root system, improper cultivation can severely retard growth and reduce yields and quality.

FERTILIZER—Fertilizer applied one year shows its effect the next year. Buds developed during the current year become the spears of the following year. As the buds are forming, food manufactured by the plant is stored in fleshy roots and then utilized to grow the spears the following year. Yearly soil tests should be taken to guide the correct liming and fertilizing of the bed. The recommended amount can be applied entirely in the spring before growth starts or divided into two applications, with half applied before growth in the spring and the other half after cutting ends about July 1. The split application is more desirable on very sandy soils than on heavier soils. After applying fertilizer and lime, scratch shallowly into the soil.

Insects and Diseases

ASPARAGUS BEETLES—Two species feed on asparagus: the common asparagus beetle (*Crioceris asparagi*) and the 12-spotted asparagus beetle (*C. duodecempunctata*). The adult of the common asparagus beetle is slender blue-black, with red thorax and lemon yellow and dark blue wing cover. The body is about 1/4 inch. The larva is dark gray with shiny black head and legs. The 12-spotted asparagus beetle has a broader back and orange-red color with each wing cover marked with six black dots. The larva of this species is orange and about 3/10 inch long. The beetles feed on spears and the plant. Keeping beds cut every 3-5 days can reduce injury to shoots by removing the eggs on the cut shoots. Recommended pesticides can be effective.

GARDEN CENTIPEDE (*Scutigerella immaculata*)—This soil pest makes holes in spears below the surface. Heavy infestations cut yields and can kill plants. No practical control is available to gardeners.

ASPARAGUS RUST—This fungus disease can weaken plants and kill them. Use resistant strains of 'Washington' varieties.

HARVESTING—Do not harvest any asparagus until the planting has two season's growth. Limit cutting in the first harvest year to 3-4 weeks. In later years, harvesting starts when spears first emerge in the spring and should be stopped between the third week in June and July 1. If harvesting is extended, plants have too short a period to set buds and store food for the crop the next year. When cutting a spear, be careful to avoid damage to an unemerged spear near the one being cut. The cutting knife should go down next to the spear to be cut. An inch below the surface, slant the knife to cut the spear at an angle. In cool weather, growth is slow and harvesting more infrequent. In warm weather, spears must be cut promptly before the tips spread and lose their tight appearance.

RHUBARB

The succulent leafstalks of rhubarb are excellent for sauces, pies, and preserves, but *the leaves of rhubarb must never be eaten.* The leaves contain amounts of oxalic acid and oxalates—sometimes in sufficient concentrations to cause fatal poisoning if eaten.

Rhubarb is a cool weather perennial plant which produces the best color and succulence in a cool climate. It does not thrive where the summer mean temperature is much above 75° F or where the winter mean is much above 40°F.

Locate rhubarb to one side of the garden where it will not interfere with the annual preparation of the rest of the area.

VARIETIES—The most popular varieties, such as "MacDonald,' 'Ruby' and 'Valentine,' which originated in Canada, have attractive red stalks. 'Victoria' is an old, vigorous-growing variety which produces very large stalks of a greenish color and inferior quality.

SOILS—Rhubarb thrives best on deep, fertile, well-drained sandy loams well supplied with organic matter. This vegetable is one of our heaviest feeders and

Clumps of rhubarb in a border of mixed herbs and vegetables. Included are the gray-leaved santolina and flowering kale which has frilly, crinkled foliage.

Alice Dustan Kollar

responds to heavy applications of well-rotted manure or compost and fertilizer worked into the soil to a depth of 12-16 inches. An abundance of moisture during the growing season is necessary to keep the plants growing.

PROPAGATION AND PLANTING—The plants are usually propagated by dividing the crowns, preferably in the fall or very early spring. The crowns are cut into as many pieces as there are buds with a supporting section of root. Faster development of new plants results if several buds are left in each root piece. Seed catalogs offer rhubarb roots and seed. Roots are preferred.

When a plant becomes 5-10 years old, the old root becomes enlarged and will produce many small, undesirable stalks. It is then time to dig the plant and divide the crown. Discard the center portion and use only the vigorous outer portions. Set the roots so that the uppermost buds are 2-3 inches below the soil surface. Firm the soil well around the root but leave the surface loose.

Plants should be set 4 feet apart and rows spaced 4-6 feet apart.

SOIL AND FERTILIZER—This crop is seldom overfertilized. If available, use liberal amounts of manure, leafmold and peat moss to improve the soil. It would not be too much to apply 1,750 lbs. of manure together with 15 lbs. of superphosphate to 1,000 square feet. Lime should be used to bring the pH to 6.0-6.5. If manure is not used, apply ¼ to ½ lb. of 5-10-5 fertilizer per plant in early spring.

SEED STALKS—Remove seed stalks as soon as they form. Failure to remove them results in fewer and more slender stalks. Infertile soil or poor strains can increase the production of seed heads.

HARVESTING—Stalks should be pulled, not cut. They can be removed without breaking by grasping near the base and pulling or twisting to one side. No stalks should be pulled until the second year after planting. The first harvest should last only 3 to 5 weeks and in later years, 6 to 8 weeks. Harvest only the best and largest stalks. If only small stalks are present, stop harvesting and sidedress plants with fertilizer. At no time should a plant have more than two-thirds of its stalks pulled. After pulling, remove the leaves and put the stalks in the shade. After washing, they can be held in the refrigerator temporarily until used.

There are few insect or disease enemies of this crop. ◆

An Introduction to some

UNUSUAL VEGETABLES

H. N. Metcalf

THE home gardener can add variety and piquancy to what can otherwise be a rather channelized vegetable diet by growing a few of the less common and unusual vegetables.

HUSK TOMATO

The husk tomato or ground-cherry is a warm-season vegetable. Botanically, the husk tomatoes are members of the genus *Physalis* in the Solanaceae (Nightshade Family). This family also contains such familiar garden plants as tomatoes, peppers, eggplants, potatoes, petunias, salpiglossis and tobacco.

The plants are downy-leaved annuals, 16 inches tall, with diffuse branching, and are often found in sandy soils in nature. The flowers are usually yellow. The fruit is a yellow berry that is completely enclosed in an inflated calyx. It is the fruit that is the edible portion of the plant. It may be eaten fresh when ripe, or prepared in a number of ways, including fried, baked, stewed; in meat dishes; in soups, dessert sauces; preserves and salads. Husk tomatoes are used extensively in Latin-American cooking, an example being in a sauce for chilis rellanos.

Sketches by Ken Dockman

The plants are easily grown. The cultural practices that give success with tomatoes should produce good results with husk tomatoes. In cool climates, start the plants indoors or in a greenhouse and transplant six-week-old seedlings to the garden approximately 5 days after the average date of last spring frost. The fruits are mature when they turn yellow and are somewhat soft. The fruits are not adapted for long storage and should be used or processed promptly after harvest.

If your culinary adventures include Mexican cooking, husk tomatoes are often an essential ingredient which can be supplied from a modest planting in the garden.

FLORENCE FENNEL

Florence fennel (*Foeniculum vulgare* var. *dulce*) is a cool-season vegetable and native to southern Europe. Botanically, like parsley, carrots, parsnips, celery and celeriac, it is a member of the Umbelliferae or Parsley Family. Except for the much more finely-divided leaves, which are feathery or thread-like, the plants somewhat resemble celery and can be used the same way. They grow about 2½ feet tall. The edible portion is the enlarged, compressed, overlapping leaf bases which develop into a solid, white, bulb-like structure. Florence fennel may be served as a boiled vegetable, or used for its sweet and pleasing anise-like flavor in fish sauces, soups, and casseroles. When blanched by mounding soil over its base, it is also used fresh in salads. The leaves can be used as a garnish. The seeds are also harvested and used for flavoring.

The plants tolerate a rather wide range of soil reaction (pH). They require

100-110 days from date of seeding to reach maturity. Ample moisture and cool weather are highly desirable for favorable growth. There may not be much enlargement of the leaf bases in the high latitudes until days shorten toward autumn.

Florence fennel is grown as a summer crop in the northern states, and as an autumn or winter crop in milder climatic areas. Where the season is long enough the seeds may be sown directly in the garden, the seedlings subsequently being thinned to stand 4-6 inches apart in rows 18-24 inches apart. Alternatively, seeds may be sown in double rows spaced 14 inches apart, the seedlings being thinned to 6-8-inch spacing.

Where growing seasons are short, it should be quite feasible to sow the seeds directly in small peat pots indoors. Following germination, the seedlings can be thinned to one per pot and grown on at 60° F night temperature until the weather becomes amenable for outdoor planting.

In mild areas, Florence fennel may be sown in autumn for late winter or spring maturity, but since protracted exposure to night temperatures below 45° F will result in premature seedstalk formation, close attention must be given to harvesting at the proper maturity, which is when the "bulb" attains approximately 2 or more inches in diameter. A blanched "bulb" is obtained by mounding soil around the leaf bases 2-3 weeks in advance of maturity. At harvest, the plants may be dug or pulled. Roots and faded or unsightly leaves are removed.

WATER-CRESS

Water-cress (*Nasturtium officinale*) is a cool-season salad vegetable. It is a member of the Cruciferae (Mustard or Cabbage Family). Water-cress is a perennial native of Europe, which has become naturalized extensively throughout the cool-temperate areas of the world. The edible parts of the plant, the upper 4-6 inches of the terminal and lateral shoots, add a sprightly, peppery flavor to salads, make a vitamin- and mineral-rich novelty sandwich filling for weight-watchers (slice the bread thinly!), and are attractive as a garnish.

The natural habitat of the plant is in clear, cold, shallow streams that are rather slow-moving. In such situations, it may either grow as a floating plant, become rooted in the bottom mud, or creep along the wet creek margins. The plants can be recognized, in part, by the odd-pinnate leaves, which have one to four pairs of small oblong or roundish leaflets, with the terminal leaflet common-

ly larger than the lateral ones. The flowers are small and white, and are borne, each on a pedicel, in gradually extending racemes. The seeds are matured in beaked siliques, with many seeds per fruit.

If one is so fortunate as to possess, or have access to, an unpolluted small stream or spring, especially one derived from a limestone formation, it should be easy to establish a self-perpetuating colony of water-cress by planting stem cuttings along the margins, or by broadcasting seeds. Commercial water-cress producers establish special beds or use small tanks through which water from a stream, spring, or well can be directed under control.

However, the home gardener can grow water-cress in rich garden soils having a reaction not lower than pH 6.0, to which ample irrigation can be regularly supplied.

The germination percentage of water-cress seed is apt to be quite low (perhaps down to 40%), so a generous seeding rate of ½ ounce per 100 feet of row is indicated. For direct-seeding in the garden, even distribution of the fine seeds will be aided if they are first mixed with very fine-textured dry sand or other inert material. The planting should be kept wet continuously through the germination, emergence, and seedling establishment periods. The seedlings may be thinned to stand 8-10 inches apart in the row. The plants should never suffer from drought. Harvest can begin in 60-70 days following a spring seeding.

If one has the advantage of a greenhouse equipped with an automatic mist system, good results should be obtained by direct seeding in small peat pots which are then placed under the mist for the germination process. Extra seedlings can be thinned out, while those retained can be transplanted (peat pot and all) either to the garden, or into larger, permanent containers and maintained under the greenhouse mist for nearly year-around harvests. Due to the leaching effects of the mist, occasional applications of liquid fertilizer are advisable to maintain vigorous growth.

KOHLRABI

Kohlrabi (*Brassica caulorapa*), a member of the Mustard Family, is also a cool-season vegetable. The name "kohlrabi" means "stem-turnip," and the plant does resemble a turnip with an above-ground stem enlargement. Kohlrabi is thought to have originated from a cabbage-like ancestor at about the end of the medieval era.

The plant is a biennial, but is grown in gardens as an annual. The bulb-like, above-ground stem enlargement tastes like a mild-flavored turnip and can be used for all the purposes for which turnips are adapted. 'Early White Vienna' and 'Early Purple Vienna' are the varieties usually offered in the United States. They mature in 55-65 days following seeding, with 'Early White Vienna' being a little earlier.

Direct seeding in the garden is the usual practice, and this may be done in the spring as soon as the ground can be worked. An eighth of an ounce is sufficient for 100 feet of row. Space rows 18-24 inches apart, and adjust the seeding rate to result in approximately 6 seedlings per foot of row. Where furrow irrigation is practiced, double-rowed beds may be used, with the rows then spaced 12-14 inches apart. Seedlings may be thinned to stand 2-8 inches apart in the row, depending on fertility of the soil.

Making a series of seedings will help to keep a continuous supply of tender kohlrabi coming along, although less than optimum results may be expected during hot weather. Where summers are warm, spring and autumn crops will be the better plan. An autumn crop can be seeded approximately 8 weeks before the usual date of hard freezes. The freezing point of kohlrabi is reported to be 30° F, so the autumn crop should be planned to mature before cold weather.

Soils that grow good cabbage and cauliflower will grow good kohlrabi. Keep the plants growing rapidly and continuously, just as with cauliflower. The plants should be kept well fertilized and well irrigated. Failure to do so will result in a tough, woody-textured vegetable.

Kohlrabi is ready to harvest as soon as the stem enlargement attains a diameter of 2 to 3 inches. The stem is cut about an inch below the "bulb," and the plants can be bunched for ease of handling while washing and carrying to the kitchen. The tops are ordinarily discarded prior to cooking or storage. A good yield is about 80 lbs. of trimmed kohlrabi per 100 ft. of row.

Kohlrabi can be stored successfully for 1 to 2 months at 32° F with 90-95 percent relative humidity. A supply kept in a poly bag in the refrigerator will extend the season of availability into summer and late autumn (when two sowings are made).

GIRASOLE

Girasole (*Helianthus tuberosus*) is a perennial vegetable and is a member of the Compositae (Composite Family). It is known also as Jerusalem-artichoke, but this is a misnomer because the "Jerusalem" part of the name is a corruption of the Italian name "girasole," which means "turning to the sun," and does not carry any connotations from the geography of the Holy Land. The true artichoke is the globe artichoke (*Cynara scolymus*).

Girasole is native along the Atlantic and Gulf coasts in eastern North America where early colonists found it being used as food by the Indians. It was taken to Europe as early as 1616, and was well known to Linnaeus by the mid-eighteenth century, since it was he who gave it its technical name. Now it is cultivated and extensively naturalized throughout the cool-temperate regions of the world. Girasole grows well on a wide variety of soils, but doesn't thrive in wet soil.

The edible portions of the plant are the tubers produced on the ends and branches of subterranean stems or root-stocks. These tubers are a storehouse for a special starch known as inulin from which the sugar known as levulose can be prepared. Levulose is reputedly useful in diets for diabetics. The tubers may be prepared for the table in almost every way that potatoes are used.

The plant is a rather coarse, rough-surfaced perennial, growing 6 to 10 feet tall. The stems bear ovate to oblong toothed leaves 4 to 8 inches long that are inserted in the opposite position, at least on the lower part of the stem, but may be alternate above. Terminating the branches are the flowering heads, which bear yellow ray and disk florets.

Because of the stature of the plants

they should be planted in an out-of-the-way corner of the garden where they will screen unsightly views or utilitarian areas during the growing season. It is inadvisable to plant girasole near or on areas where borate herbicides have been used, as the plants are sensitive to boron.

Girasole is propagated almost exclusively by means of the tubers, which are planted in either spring or autumn. Both white- and red-skinned forms are known, but the white-skinned are certainly the more common in the United States. For new plantings, whole tubers averaging 8 to 9 ounces in weight are considered desirable planting stock. Larger tubers may be cut into pieces in the same manner as potato seedstock. If a spring planting is to be treated as an annual one, the seedstock may be planted 4 inches deep at 15- to 24-inch intervals in rows spaced 30-60 inches apart on well-prepared, well-fertilized ground. Once established, comparatively little care, apart from fertilization and irrigation, will be needed, as the plants tend to shade out weed competition. Yields equivalent to 10 tons per acre are possible.

If one acquires a garden with an established planting, the next year's harvest can be virtually assured by leaving, or planting back, some of the tubers found in the ground at harvest in the autumn. The tubers have a freezing point slightly lower than that for potato tubers, so they will overwinter successfully in most instances and start growth as soon as the soil warms sufficiently the next spring. In fact, small tubers left behind at harvest are probably the means by which girasole has become extensively naturalized—and even weedy.

Harvest should be deferred until the tops have been killed by frost in the fall. At digging, a thorough search for tubers with a spading fork or potato hook should be extended some distance from the plants, as the root systems tend to be extensive. For home use, the tubers are perhaps best dug as needed, so long as the ground remains unfrozen and workable. This is because the tubers of girasole are thin-skinned and wither much more readily than potato tubers. When deep freezing of the soil is imminent, a supply of tubers sufficient to meet needs during the cold months should be dug, washed, and prepared for storage. Girasole tubers store best at 32° F with 90-95 percent relative humidity; under these conditions storage should be successful for two to five months. Higher temperatures and lower humidities lead to a shorter storage life. It should be possible to keep a small supply in poly bags in the crisper section of the kitchen refrigerator. Additional supplies of tubers may be dug from the garden as soon as the soil thaws in the spring, just as with parsnips. Spring-dug tubers may taste sweeter than autumn-dug ones, due to inulin-levulose conversion during the winter.

If potatoes become monotonous in your daily fare, grow some girasole for variety!

CELERIAC or KNOB CELERY

Celeriac (*Apium graveolens* var. *rapaceum*), a cool-season vegetable, is a close relative of celery in the Umbelliferae (Parsley Family). Rather than having extensive development of the petioles

as occurs in celery, celeriac, also known as knob celery, develops a thickened, turniplike base. This thickened base is sometimes used raw in salads, imparting a flavor something like a blend of celery and parsley. It is more commonly served as a boiled vegetable.

Celeriac grows best where the monthly mean temperature is 60-65° F. during the growing season. It will be marginal or unsuccessful in areas or at seasons where the monthly mean temperatures exceed 70-75° F. or are lower than 45° F. In general, celeriac should succeed wherever celery does, and its culture closely resembles the practices followed for celery. Celeriac plants grow somewhat more slowly than do early celery varieties. Approximately 110 days are needed to mature celeriac after the plants have been set out in the garden.

Although several varieties are grown in Europe, 'Giant Prague' has been the only variety readily available in America. 'Alabaster' is a new variety that should be worth trial planting. In common with many members of the Parsley Family, the germination percentage is apt to be rather low (perhaps 55-70 percent), so the seeding rate should be rather generous. Emergence can be hastened if the seeds are placed on wet paper toweling in a shallow, plastic-covered pan and kept in a warm (70° F.) place for several days. The seeds are ready to sow as soon as the radicles begin to appear. To facilitate handling, the pre-soaked seeds may be dried until the surfaces are relatively free from moisture, then mixed with some inert substance (such as cornmeal) and sown immediately, either in a flat in the greenhouse, or, if the weather has warmed sufficiently, directly in the garden. Kept in a greenhouse at 70° F., the seedlings should emerge in about 10 days, and will grow well if kept at 60-65° F. night temperature during the seedling stage (days 10° F. warmer). In the garden, emergence from the seed stage will be slower.

In the greenhouse, seedlings can be transplanted to suitable containers as soon as the first true leaves develop, and should be ready to set out in the garden 8-12 weeks after seed-sowing.

In the garden, the transplants may be set out, or seedlings thinned, to stand 4-6 inches apart in rows 24 to 36 inches apart.

Exposure of seedlings to night temperatures of 45° F. or lower for any length of time will likely result in a proportion of them producing seedstalks rather than the desired enlarged root, so time of transplanting to the garden, or of garden-seeding, should be adjusted according to prevailing weather.

Like celery, celeriac will respond well to ample water, fertilizer and organic matter.

When ready to harvest, the roots will have attained diameters of 2 to 2½ inches. The plants are dug or pulled. The tops are trimmed away and the branching roots at the base removed. The trimmed product can be stored in moist sand in a cool place for subsequent use, much as with root crops.

CELTUCE or ASPARAGUS LETTUCE

Celtuce (*Lactuca sativa* var. *asparagina*) also known as asparagus lettuce or stem lettuce, is a special form of ordinary lettuce, and like it, is a member of the Compositae (Daisy Family). Celtuce has been known to American gardeners sporadically since late in the nineteenth

century, but current stocks probably derive from seeds sent from western China by a missionary in the early 1940's.

Celtuce differs from ordinary lettuce in that it is grown for the thickened edible stem. While the young leaves are not of notably high quality, they may be used in salads up to the time they become bitter, or they may be fed to leaf-eating pets.

Celtuce may be direct-sown where it is to mature as soon as your garden is in condition for planting in the spring. When the seedlings are about 2 inches tall, they should be thinned to allow a spacing of about 1½ square feet per plant. Although the plants require about the same length of time to mature as the 'Great Lakes' type of head lettuce (approximately 80 days), no head will be formed. Rather, a rosette of leaves appears, from which arises the thickened edible stem. This stem remains edible until the flower buds appear, and harvest may begin as soon as the basal diameter reaches an inch or so. In harvesting, the stems are cut at ground level, cleaned of leaves and debris, and washed.

In the kitchen, the stems are peeled to obtain the delicately flavored core, which can be cut in strips for serving as a fresh vegetable or cut more finely for use in salads.

Celtuce may be cooked in various ways and is especially delicious when prepared *au gratin*. The tender light green cores are cut into 1-inch slices and boiled for 3 to 4 minutes in a small amount of water. Drain, place in a baking dish, cover with a cheese sauce, sprinkle with breadcrumbs and cheese, and put in the oven to brown.

RUNNER BEANS

Runner or multiflora beans (*Phaseolus coccineus*) like peas, garbanzos, lentils, and other beans, are members of the Leguminosae (Pea Family). Runner beans are probably natives of Central or South America, whence they were introduced to Europe as ornamentals early in the seventeenth century. While known in America mainly for the brightly colored flowers of 'Scarlet Runner', these beans [illegible] England and on the Continent. Thus, the runner beans can be dual-purpose plants.

The edible portions include the young pods (said to be best if French-cut before cooking), and the immature (green-shell) and mature (dry-shell) seeds which are used like lima beans. Since the pods develop fiber and a string, harvest them while yet young and tender.

Although the plant is by nature a perennial, forming an underground storage organ (root tuber), it is commonly treated as an annual in cool-temperate climatic zones. If desired, the enlarged root (with a piece of the stem attached) may be dug in autumn and kept over winter under the same storage conditions as for dahlia tubers. The plants will produce beans in some areas not favorable for lima bean culture but the harvest is somewhat lower in quality.

The runner beans have comparatively large seeds (20-25 per oz.). The observant gardener will be intrigued to discover that the cotyledons remain below ground in germination (hypogeal germination), in distinct contrast to common beans (which exhibit epigeal germination).

The general culture of runner beans is similar to that for pole forms of common, lima and 'Kentucky Wonder' beans. Plant runner beans in the garden after the soil has warmed to 55-60° F. The plants will grow as high as 12 feet and require 115-120 days from planting to mature seeds. Hence, they are best grown to maturity in areas having long frost-free autumns. In short-season areas, some advantage may be gained by starting the plants in peat pots indoors or in the greenhouse and transplanting to the garden in late spring. ◆

Nutritious and highly suitable candidates for the home garden

CABBAGE, BROCCOLI AND THEIR RELATIVES

P. A. Minges

CABBAGE, cauliflower, broccoli, brussels sprouts, Chinese cabbage and kohlrabi are closely related vegetables of the Mustard Family (Cruciferae). They are sometimes called cole crops. All are well suited to growing in the home garden at one season or another throughout the United States. They are nutritious, productive in terms of land use, and of superlative eating quality when harvested in prime condition and used fresh from the garden. Cauliflower, broccoli and brussels sprouts can easily be preserved by freezing while cabbage is adapted to storing for reasonably long periods.

Being cool season vegetables, they grow well at moderate temperatures of 65° F to 80° F, and usually develop best table quality when they reach harvesting stage in relatively cool weather. They cease growing when temperatures drop below 50° F. This means that, once mature, these vegetables will hold well in the garden in late fall and even during the winter in areas where the ground seldom freezes.

Cauliflower and Chinese cabbage will tolerate light frosts or freezes. The other crops are even more tolerant, sometimes withstanding temperatures as low as 20° F. for short periods.

Temperature also has a bearing on the flower development of these plants. Cabbage, brussels sprouts and kohlrabi are biennials, making leaf growth the first year and flowering the second. However, after the plants have several true leaves, a 3- or 4-week period of exposure to temperatures below 50° F may result in formation of a seed stalk rather than a usable product. This can sometimes be a problem when plants are set in the garden in late fall or early spring.

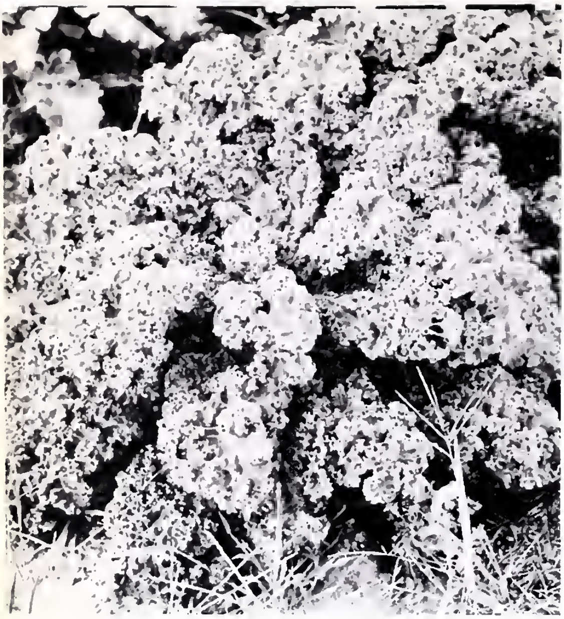
In general, these vegetables are suitable for growing in gardens in the northern states for summer and early fall harvest, in milder areas for late spring and fall harvest, and in the South for late fall and winter harvest.

Culture

All cabbage relatives can be grown on a fairly wide range of soils though they do best on fertile, well-drained sandy and silt loams. If the soil is acid, lime should be added to bring the pH to around 6.5.

On soils known to be low in fertility, 3 to 4 pounds of a complete fertilizer such as 10-10-10 should be applied on each 100 square feet and worked in while preparing the soil. On gardens well fertilized in recent seasons, from 1 to 1½ pounds per 100 square feet may be adequate. A sidedressing of nitrogen, about 1 pound of ammonium nitrate per 100 feet of row, applied 3 to 4 weeks after planting, may be beneficial, especially if considerable rain caused leaching of fertilizer during the early part of the growing period.

Cabbages and their relatives may be started by seeding directly in the garden or by setting transplants. Seed is suggested for kohlrabi and Chinese cabbage. Transplants are preferable for cauliflower, brussels sprouts and early spring plantings of broccoli and cabbage. A good transplant is 4 to 6 weeks old with four to five true leaves, slightly hardened and free of disease. Transplants to be used for early spring planting should be grown at temperatures of 60°F. or above



Marjorie J. Dietz

Kale (see also page 34) is a very hardy cole grown for its edible foliage which is boiled. In the north, the leaf harvest is in fall and early winter.

otherwise premature seeding may occur. In direct seeding, the seed should be spaced about 1 inch apart in shallow furrows and covered with ½ to 1 inch of soil. Use the deeper covering for summer plantings on sandy soils. Thin the plants to the desired spacing when they have two to four true leaves. Excess plants can be moved to another row to provide a slightly later crop as the transplanting will delay development by ten to 15 days.

Row spacing of 30 to 36 inches is suitable for broccoli, cabbage and cauliflower, with spacings of 15 to 20 inches between plants in the row. When raised beds are used, plant one row per bed unless the beds are more than 36 inches from center to center.

Most weeds can be adequately controlled with hand cultivators and hoes. Triflualin (Treflan) and Dacthal are herbicides that can be applied before planting, but first check the label to make sure the chemical is approved for the vegetables in your garden.

All of the cole crops grow fastest and develop best quality when supplied with adequate moisture throughout the growing season. Timely irrigation is advisable when rainfall is deficient.

Using disease-free seed or transplants offers control for certain diseases. Fusarium yellows is best avoided by using resistant varieties. Foliage diseases such as downy mildew and Alternaria may cause damage unless controlled by spraying with fungicides such as Maneb or Bravo. Club-root, a soil-borne disease common on all cabbage and related plants, often is introduced on infected transplants.

Troublesome insect pests include the cabbage maggot, flea beetles, aphids, cabbage worm and cabbage looper. Where maggots are a problem, use Diazinon in the water poured around the roots of a transplant as it is set out. Flea beetles, which feed on young seedlings or newly set transplants, can be controlled by spraying or dusting with Malathion or Carbaryl. Aphids and caterpillars are troublesome later in the season. Aphids are hard to control without using toxic chemicals which are too dangerous to use on food crops, so perhaps the most feasible procedure is to remove and destroy the parts of leaves where colonies occur. The new bacterial formulations, such as BT (*Bacillus thuringiensis*), have been quite successful in controlling cabbage worms and loopers.

Broccoli

This vegetable has been rapidly increasing in popularity since about 1940. The green buds and flower stems are the edible portion. The center shoot may measure 5 to 8 inches in diameter. After it is harvested, side shoots develop which extend the harvest period for a month or more. The heads remain in edible condition fairly long in cool weather, but go past maturity very quickly in hot weather. From 6 to 12 plants will be adequate for most families unless much freezing of the harvest is anticipated.

'Spartan Early,' 'Waltham 29,' 'Coastal' and 'Italian Green Sprouting' are standard varieties suitable for the central and eastern portions of the United States. Medium strains of 'Green Sprouting' and 'DeCicco' are popular on the West Coast. Hybrids (F_1), including 'Green Comet' and 'Gem' are excellent, very uniform varieties, but in the home garden, less uniform maturing is often an advantage.

Broccoli may be started from transplants or seeded directly in the garden and later thinned to the desired spacing. The latter method is easier but a 2- to 3-week longer growing time is needed. Best results in most of the United States are obtained by seeding or transplanting in late June, July or early August for a fall harvest. Generally plantings made after September and before April 10 yield rather poorly due to premature heading. In the Deep South and southern California, plantings can be made in late August and September for winter harvest. Usually it takes 60 to 85 days from transplanting to harvest, or 85 to 110 days from seeding.

Cabbage

Standard cabbage as well as red and Savoy-leaved types are suitable for gardens in the United States. Hybrid (F_1) varieties offer greater uniformity of maturity and size of head, though the former may not be an asset in home gardens. 'Golden Acre,' 'Charleston Wakefield' and 'Early Jersey Wakefield' are widely used, small headed, early varieties. 'Early Marvel' is an English variety of excellent quality, not sufficiently known in this country. 'Copenhagen Market,' 'Greenback,' 'Market Prize' (F_1) and 'King Cole' (F_1) are popular midseason types. 'Danish Ballhead' is late and stores well. 'Early Round Dutch' is less likely to develop seedstalks when planted in early spring. 'Red Acre,' 'Red Head,' 'Savoy King' (F_1) (all midseason) and 'Chieftan Savoy' (late) offer diverse types.

Though transplanting is the usual method of establishing cabbage, direct seeding with later thinning is also feasible. Cabbage grown from seed in the garden will take 2 to 3 weeks longer to reach maturity than transplants.

All-America Selections

Emerald Cross' cabbage

The heads are ready for harvest when they become fairly firm. Fast-growing early varieties will reach the harvest stage in 65 to 75 days from transplanting when conditions are favorable, that is, with moderate temperatures (70 to 85°F.) and fairly long days. Later varieties may require 110 to 120 days.

Healthy plants left after cutting the head, especially in early fall, often will produce several edible small side heads, thus extending the harvest season. In warm weather the heads will split soon after reaching the harvest stage, but in cool weather they may remain in good condition for several weeks. In cold areas, heads should be harvested before hard freezes occur and stored for later use. Best conditions for storage are high humidity and temperatures of 32 to 40°F.

Cauliflower

The Snowball group is the most practical for the home garden. This type will head well in summer and early fall in cooler areas of the country and during the fall or spring in most of the warmer areas. Varieties differ in days to maturity and in size and shape of the head or curd. Another group, the purple-headed varieties, perform similarly to the Snowball type. These turn green when cooked and resemble broccoli in appearance. In areas with open winters, the winter type of cauliflower can be grown for harvest from December on through the winter months. This type requires exposure to rather cool temperatures to initiate head formation so heads do not form until December or later. 'November-December,' 'February' and 'Mayflower' are common varieties.

For most gardeners the ideal time to set plants of the Snowball and purple types in the garden will be July or August. From 2 to 3 months are required for the crop to attain maturity. To obtain pure white curds of Snowball, it is usually necessary to protect the developing head from the sun by tying the inner leaves together or by breaking 2 or 3 center leaves over the head. Do this when the young heads are 2 to 3 inches in diameter. Examine the heads periodically to determine when they are big enough to use. Exposed curd turns somewhat yellowish, but this seems to affect only appearance and not flavor. The winter type does not require tying as the inner leaves curl over and protect the head. Cauliflower passes the edible stage rather rapidly, especially in warm weather, so if too much matures at one time for fresh use, the extra heads should be harvested and frozen before the curd becomes "ricey" or starts to separate.

From 3 to 6 plants per planting will be sufficient for most families.

Brussels Sprouts

This plant is generally grown for fall and winter production, since the sprouts are of best quality if they develop in cool weather. Transplants can be set in the garden in late May, June, or early July as the first sprouts will form in 90 to 110 days. A plant spacing of 3 feet by 3 feet is common. 'Catskill,' 'Long Island Improved' and 'Jade Cross' (F_1) are the principal varieties. A good sprout is 1 to 1½ inches in diameter and fairly firm. Sometimes the first sprouts to form are large with loose leaves, especially if the weather is still warm. These may be discarded. In harvesting, the leaves beneath the usable sprouts are removed and then the sprout is twisted or cut off. The sprouts above will continue to develop as long as the weather is favorable, so in areas with warm winters plants may produce throughout the winter. Debudding, that is cutting out the growing point in late August or early September, tends to induce all of the sprouts to be ready at about the same time, which may be helpful in locations where the harvest season is rather short.

Kohlrabi

For information on the culture of kohlrabi, see page 66 of this Handbook.

Chinese Cabbage

Chinese cabbage (*Brassica pekinensis*) belongs to a different species from the other cabbage vegetables, which are varieties of *B. oleracea*. The heading type is the one commonly grown in the United States. It is an annual which develops relatively solid heads and a pleasing flavor at moderate temperatures. Best results are generally obtained by seeding in the garden in June or July so the plants will reach the heading stage during the shorter days and desirable temperatures of early or mid-fall. If planted earlier, the plants often develop flowers before a good head is formed. Heads maturing in hot weather often have a strong, undesirable flavor and poor texture.

'Michihli,' a tall, cylindrical variety with dark green leaves, is fairly dependable in heading and reaches the harvest stage in 75 to 85 days from seeding. 'Wong Bok' is a later and shorter variety. A suitable spacing for plants is 8 to 10 inches apart in rows 2 to 3 feet apart. ◆

The so-called vine crops—squash, pumpkin, cucumber, watermelon and muskmelon—

SQUASH AND ITS RELATIVES

Cecil L. Thomson

SQUASH and its relatives belong to the Cucurbitaceae, more commonly known as the Gourd or Cucurbit Family. These vegetables generally require substantial space in the garden because of their rambling growth habit, and only a few dwarf compact types exist for planting on small properties.

Cucurbits have many similar cultural requirements. Since they are all warm-season crops, they are suited to regions with long hot summers. All do best in fertile, well-drained sandy soil. Squash, cucumber and pumpkin are somewhat more adaptable than melons, both in their tolerance of cool weather and of heavier soils.

Muskmelon and watermelon, in addition to needing warm sandy soil, should have a sheltered position to protect them from chilling wind. Muskmelons, cucumbers and squash are extremely sensitive to soil acidity and require a pH of 6.0 or higher in order to thrive, but watermelons can grow in quite acid soils.

The soil should be prepared well in advance of planting. If a cover crop or sod is to be turned under, this should be done in the autumn or early enough in spring for the organic matter to decompose. All the vine crops respond to applications of well-rotted manure or compost. If soil tests indicate the need, add lime and fertilizer in the recommended amounts. Just before planting, these applications should be lightly cultivated into the soil and the surface raked smooth.

Where the soil is poorly drained, it is advisable to use raised beds which should be 4 to 8 feet wide and just high enough to provide the needed drainage.

The use of black plastic mulch is as valuable for home gardeners as it is to commercial growers. The plastic mulch tends to warm the soil, completely controls weeds, reduces leaching of fertilizer, insures a uniform supply of moisture, eliminates root injury caused by cultivation, and prevents soil erosion. In areas where rainfall is scanty and artificial watering is anticipated, it is a good plan to place a canvas soaker between the rows before unrolling the plastic. This method gets water directly to the roots and, unlike overhead sprinkling, does not wet the foliage and thereby invite leaf spot diseases.

The mulch should be laid out after the soil is prepared for planting. Edges of the plastic are tucked into a furrow and secured with a covering of soil. Holes are made in the plastic at regular intervals to permit placing of seeds or plants.

Starting Plants Indoors

In colder areas where the growing season is short, seeds can be started indoors. About four weeks before the last frost

Roche

'Butternut' is a favorite winter squash.

Roche

Zucchini is a bush-type summer squash which should be harvested when small.

date, three or four seeds are sown in a pot, 4-by-4-inch plant bands, or one of the plantable fiber containers which minimize root disturbance. Pots should be set in a warm place (at least 70° F) to germinate. After germination, plants need full sun with daytime temperatures of 70 to 75° and 60 to 65° at night.

Seeds of most vines may be planted outdoors a week or ten days before the date of last frost. When seeding outdoors, place 6 to 8 seeds in each hill, cover with ½ inch of soil and firm with the back of a hoe. When seedlings appear, remove the weaker plants to leave no more than 2 or 3 plants per hill.

Insects and Diseases

The principal insect pests are cucumber beetles, aphids, squash bugs and squash vine borer. It is advisable to check noxious insects before vines come into flower, using Methoxychlor or similar sprays. All the Cucurbits require cross pollination for proper fruit set. As bees do most of the pollinating, insecticides such as Sevin should not be used when bees are active. Gardeners are often confused about crossing between species. None of the species of vine crops discussed here, under garden conditions, will cross with any other species, that is, muskmelon and cucumber will not cross.

Cucurbits are susceptible to many diseases. Virus diseases, which are becoming increasingly serious, are spread mostly by aphids and cucumber beetles so control of these vectors is essential. Additional precautions include the use of treated seed and the practice of strict weed control and rotation of crops.

Cucurbits produce both male (staminate) and female (pistillate) flowers on the same plant, the male flowers outnumbering the female by as many as 20 to 1. Fruit develops only from the female flowers which can be identified by the ovary at the base of the flower, an enlargement that looks like a miniature of the mature fruit. Obviously the preponderance of non-fruiting males limits the productivity of the vine. In recent years, plant breeders have been developing varieties in which female flowers predominate and males are absent or in a small minority.

Pumpkin and Squash

Squash are classified as summer types, which are eaten while still young, and winter squash, which are allowed to mature and develop hard rinds to permit winter storage. The many types of summer squash—crookneck, straightneck, zucchini, cocozelle and scallop or patty pan—are all excellent for home growing. Among winter squash, 'Acorn' or 'Table Queen' is a favorite for its handy small size and sweet flavor. 'Butternut' and the newer 'Waltham Butternut,' prized by cooks for their fine, solid texture and nutlike taste, are also popular with home gardeners because of their resistance to squash vine borers. A welcome new development in winter squash is the bush-type 'Gold Nugget,' which bears its bright orange fruit close to the base of the plant, not on runners, and therefore is suited to small vegetable plots.

Squash can be grown either by starting plants indoors or by planting seed in the open garden. For summer squash, hills are spaced 3 feet apart in rows 4 feet apart. Bush types of winter squash use the same spacing, but vining types like the butternuts need 6-by-6-foot separation. Pumpkins and Hubbard squash need no less than 8 by 8 feet. Squash and pumpkins are often planted between hills of corn to conserve garden space.

Winter squash should be handled carefully to avoid bruising, as fruit with soft spots or broken skin will not keep. To store winter squash, cut stems from mature fruit and keep in a well-ventilated warm place for several weeks. Examine the fruit frequently and remove any that show evidence of decay. The remaining sound fruit are placed in a clean area where the temperature can be kept at 55° F with a 60 percent relative humidity.

Cucumbers

Cucumbers are probably more widely grown in home gardens than any other vine crop. Intensive research and experimental breeding have produced a splendid selection of high quality, high yield, disease-resistant varieties, so that cucumbers are now the most reliable of the cucurbits.

Cucumbers are classified as pickling and slicing or table types. A pickling variety can serve for both purposes.

Cucumber seed may be planted in the garden about two weeks before the last frost date. If planted in hills, space them 3 to 4 feet in both directions. For row planting, make the rows 4 feet apart and thin plants to stand one per foot of row. To save space and keep the fruit from contact with damp ground, cucumbers may be trained to climb a fence or wire netting. To provide young cucumbers right to the end of the growing season, two plantings should be made—one about two weeks before the last frost, the second two or three weeks later, but not after June 20 in the northern states.

Many disease-resistant varieties with hybrid vigor are now available. Among the best for pickling are 'SMR 58,' 'Wisconsin SMR-18' and 'Pioneer'—the last being a type that bears no male flowers and has seed of a pollinator added to the packet. Among top-quality slicing varieties are 'Marketmore,' 'Meridian' and 'Hi-yield.' 'Spartan Valor' bears a few male flowers, enough for self-pollination, but the all-female 'Victory' needs an added pollinator.

Continued

Helen S. Witty

In very sandy soil, good cucumbers can be grown by filling a trench with rich compost or fresh seaweed.

The trench is then filled with soil, the seeds are planted (under Hotkaps for an earlier crop) and *(below)* a long harvest of cucumbers results.

Muskmelon

Muskmelon includes honeydew, Casaba, Persian, Crenshaw and the netted muskmelons. The first four are limited to long-season areas of the West and Southwest where irrigation is practiced. Netted muskmelons are the only type that can be grown successfuly in the North, and then only in warm, sandy soils and sheltered locations.

For best results, set plants in soil mulched with black plastic after the last frost date. If plants are unobtainable, seed may be sown through holes cut in the plastic a week or ten days before the last frost date, providing the soil is warm.

Virus diseases of muskmelons are so severe in some areas in the North that the plants die before any fruit is harvested. Since resistant varieties are not available and control methods are usually ineffective, home growers may be disappointed in their attempt to grow this vegetable. It is important to select varieties that are resistant to fusarium wilt, such as 'Delicious 51,' 'Iroquois' and 'Harper Hybrid.'

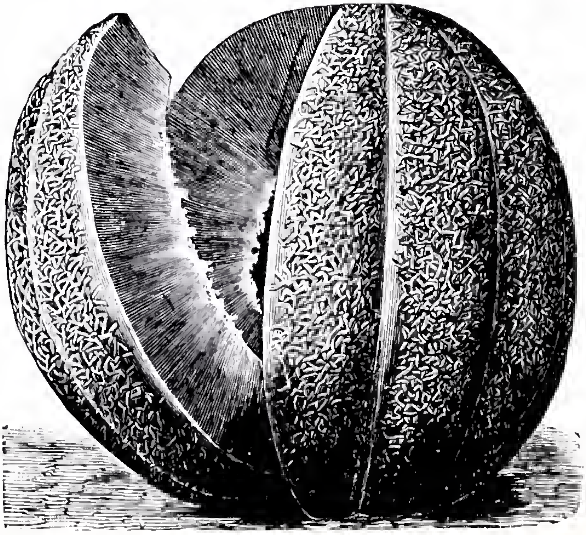
Muskmelons are ripe when they will separate easily from the stem either by light pressure from a finger or by lifting them off the ground.

Watermelon

Watermelon is a reasonably reliable crop in the northern states providing an early variety is selected. The use of started plants and black plastic mulch will produce an early harvest for picnics and barbecues when sweet, juicy watermelons are most in demand.

Watermelons have no special soil requirements except that warm, sandy soils are preferable. Seeds or plants are set out after the date of last frost, in hills spaced 6 by 6 feet apart. Watermelons should not be harvested until fully ripe, when the rind on the underside turns from white to pale yellow.

Good varieties for northern home gardens are 'Summer Festival,' with an average weight of 15 pounds, and 'Sugar Baby,' 8 to 10 pounds, a so-called icebox melon because of its compact size. 'Seedless Hybrid 313' is an innovation which does not produce viable pollen and must have a pollinator—'Sugar Baby' is often chosen as companion—to assure setting of fruit. ◆



Among the easiest vegetables to grow in the home garden

ONIONS AND RELATED VEGETABLES

William Sanok

IF you follow a few basic practices, you can be sure of having a good onion harvest. Many gardeners like to raise onions because they produce a comparatively high yield for the space required and also because they have so many culinary uses. They can be harvested during the growing season as green onions for salad or later as mature bulbs, to be eaten raw or cooked. Another consideration: onions can be stored for use long after the growing season is over.

The onion is a vegetable that is greatly affected by length of daylight. Therefore, if you plan to raise onions, you ought to select a variety that will do well in your area. In the South, onions are raised during the winter months and require shorter days. In the northern part of the United States, most varieties require about 16 hours of daylight for bulbing. Onions that require even longer days are raised farther north.

In selecting a variety, it is best to select from seed catalogs with recommendations for your particular area. The varieties that do well in the Northeast include: 'Early Harvest,' 'Downing Yellow Globe,' 'Ebenezer Sets' and 'Beltsville Bunching Onion.' All but the Beltsville variety are raised for mature bulbs.

Soil Preparation

Onions grow best on soil that is well drained and can be worked early in the spring. If you live in a part of the country where the soil is distinctly acid, it should be limed to a pH of 6.2 to 6.5. The best way to be sure of the pH level (soil acidity) is to have the soil tested. Simple pH test kits are available from many different sources including garden centers.

The soil should be well fertilized and many people have had success with using a 5-10-5 garden fertilizer at the rate of about 5 pounds per 100 square feet. The soil should be worked as soon as possible in the spring to obtain a fine seed bed.

Planting

Onions can be grown from seed, or more commonly in home gardens from sets or transplants, between the first of April and the first of May. Onion seed can be sown directly into shallow furrows, about ½ to 1 inch deep, using 10 to 15 seeds per foot. These are later thinned to a distance of 2 to 4 inches apart. Rows generally are spaced 12 to 18 inches apart. Onion sets and transplants are spaced 2 to 4 inches apart in the row. This vegetable is very cold tolerant and will continue to grow even at temperatures of 40° F.

Weed and Insect Control

Onions do not need much cultivation, only enough to break up any crust and to destroy weeds that might compete with them. Be sure to avoid deep cultivation as this will injure or kill the shallow root system. Cultivation should be done early in the season as most of the weeds are troublesome during the months of May and June. If the garden is kept free of weeds during this period, it will be easier to keep weeds under control for the remainder of the season.

Onions take up little home garden space as shown by this short row of plants.

Paul Frese

Uniform ripening of onion bulbs results when tops are bent over by hand.

There are only two insects of major importance. They are onion maggot and thrips. The onion maggot is a problem, especially on seeded onions during the early part of the season. The adult is a fly which lays eggs on the young stem of the plant. After the egg hatches, maggots bore into the roots destroying them and the small bulb. This insect can be controlled by using Diazinon around May 10th. In many gardens, maggots are not a severe problem, but some damage can be expected without chemical control. The other insect is thrips which can be controlled by Malathion during the months of June and July. This insect is very small and feeds on the leaves, especially during the hot dry weather of this period.

Disease Control

There are only a few diseases that gardeners should be concerned with in raising onions and related crops. The first is blast which comes in humid weather and causes white speckles on the leaf. Downy mildew also attacks onions during humid periods and causes the leaves to turn white and eventually dry up. Onion transplants, especially the sweet Spanish type, are subject to a disease called purple blotch, a fungus that cause lesions on the leaves which later turn dark purple. The storage life of infected bulbs is shortened. Onion diseases can be controlled by regular spraying with Maneb or Captan, beginning the first of July.

Tip burn, a physiological condition that causes the tips of the leaves to die, is often of concern to gardeners. It is caused by improper moisture and nutrient balance in the plant. It occurs during drought, after root pruning as a result of deep cultivation, or after flooding. Flooding actually causes damage or death to root hairs and cuts down on water absorption.

Harvesting

Onions grow quite rapidly during May and June and reach a peak in top or leaf growth around the end of June. As the critical day length is reached, the plants react by starting to form bulbs. It is important to plant onions early so that they make adequate top growth before this critical day length is reached.

The first sign that the onion has started to bulb is the cessation of new growth from the center. When no new leaves are produced, the plant will then translocate its sugar into the bulb causing it to increase in size. When onion bulbs are ripe, the tops begin to yellow and fall over. It will promote uniform ripening if all tops are bent over by hand. When the tops are dead, pull the onions and lay them in a dry place for three or four days. Once they are thoroughly dry, the tops are cut off within ½ to 1 inch from the bulb. Bulbs are stored in a dry place, such as a garage or cellar at a temperature of 34° F to 36° F and about 75 percent humidity. If bulbs are kept dry, they will store for two to three months.

Leeks

Leeks are closely related to the onion but are hardier and are grown in much the same way. Leeks are started from seed and do not bulb as onions do. Toward the end of summer, leeks are blanched by hilling soil against their stems. These thickened stems and green leaves are used in soups and stews.

Garlic

Garlic is grown much like onions. The usual procedure is to plant cloves rather than seeds or transplants. Cloves, which are small segments separted from a large cluster, are planted 3 inches deep and 3 inches apart. For a change of flavor, the leaves can be snipped and used green like chives. Mature clusters are harvested, dried and stored like onions. The chief commercial varieties are the early white or Mexican and the late pink or Italian. The early variety does not store well and is inferior in quality but does outyield the late type.

Marjorie J. Dietz

The purple flowers of chives are among the most decorative of edible plants.

Shallot

The shallot is becoming increasingly popular, especially in the Northeast. It looks somewhat like a small tulip bulb, with a shiny brown skin which, when peeled, reveals a purple outer surface. The delicate flavor and fragrance of shallots is highly esteemed in gourmet cooking when a mild onion taste is wanted. The leaves can be used green like those of chives. Individual cloves are planted just below the surface and harvested like onions.

Chives

Chives are another relative of the onion, grown for their tubular leaves which are used as a topping for salads, cold cream soups, potatoes, and in egg dishes and appetizers. Chives can be grown from seed or, more conveniently and for quicker results, bought already started in pots. Divisions of the roots can be potted for indoor use during the winter. ◆

Home vegetable gardens are subject to attack from a wide variety of insect pests

CONTROL OF INSECT PESTS

Milton S. Savos

SOME insects are certain to be present in pest proportions every year while others may appear one year and not the next. Weather and the type of plants grown are among the factors involved. Regardless of your geographical location, you can be sure that some pests will be present and will need to be dealt with.

Identification

A fundamental problem in pest control is the identification of insect pests and the damage they cause. The physical presence of an insect on a damaged plant does not necessarily mean that it is the one that caused the damage. Identification of an insect pest is important in control since it can furnish information such as the type of mouth parts and therefore the nature of the injury it causes. It is helpful to know what stages of the insect are injurious, how many generations it has a year, what its favorite food plants are, when it is active and where it lives.

Inexpensive illustrated pocket books on insects are available at bookshops. If you need further help, you can get it free of charge from your local county agent or from the agricultural section of your state land-grant university or college. If you mail insects for identification, first make sure they are dead, then enclose them in a crush-proof container. Plant samples should be of adequate size and representative of the damage.

Chewing Insects

Nearly all the injury caused to vegetables by insects results from their efforts to obtain food. Insect pests are commonly classified as two types: those with chewing mouth parts and those with piercing-sucking mouth parts. Insects with chewing mouth parts feed by biting off external parts of plants, grinding them up and swallowing them. The injury they cause is evident as chewed-out portions of plants or in extreme cases, plants stripped of foliage. Examples of insects with chewing mouth parts are grasshoppers, caterpillars and beetles.

Sucking Insects

Insects with piercing-sucking mouth parts feed by piercing the plant and withdrawing the internal liquid. This type of feeding results in minute spotting of the foliage or fruit, curling of foliage, deforming of fruit, or a general wilting, browning and dying of the entire plant. Aphids, leafhoppers, whiteflies, squash bugs and plant bugs are familiar examples of insects with sucking mouth parts. Many sucking insects are highly efficient transmitters of plant diseases.

Internal Feeders

Many of our worst pests, and those hardest to control, feed within the plant tissue during a part or all of their destructive stage. They gain entry by being deposited as eggs or by chewing their way into the plant. Internal feeders are commonly called borers, weevils, leaf miners and gall insects. In addition to this group are insects that feed below the surface of the soil where they may chew the root system, suck the sap from it, or bore into the roots and form galls on them. This group includes root maggots, white grubs, root aphids and wireworms.

Methods of Control

Control measures should start early with the destruction of plant refuse that may harbor pests and with the removal of weeds in and surrounding the garden. Soil-inhabiting insects must be controlled

Certain vegetables, such as cucumbers and other vine vegetables, can grow several inches a day, thus outgrowing the protection given by insecticides.

Roche

before or at the time of planting. Most other pests can be controlled as they appear.

To forestall extensive injury, the home gardener should inspect his garden regularly, at least once and preferably twice a week. At the first sign of infestation, a control measure should be applied and repeated as often as necessary. Some pests reproduce at an almost unbelievable rate and can overwhelm plants rapidly. Many people wait until they have a severe insect infestation before they apply controls. Very often this is too late because drastic plant damage may already have occurred.

When applying chemicals, be sure to cover all surfaces of a plant. Many insects feed only on the lower surfaces of foliage and are not affected by chemicals applied to the upper surface. An insect must come into contact with the insecticide if it is to be killed.

Frequency of Treatment

Most of the insecticides currently recommended for home garden use are effective only for a week to ten days. Insects appearing on treated plants after this time would not be affected. Some plants such as cucumbers and squash may grow several inches a day and therefore outgrow protection rapidly. If a treatment is followed by heavy rain within a day or two, it will be necessary to repeat the application.

A measure of control can be achieved by treating vegetable gardens with insecticides very ten to fourteen days. Such preventative treatments keep most pests at a low level throughout the season, though some damage to crops will be inevitable.

Because of differences in pesticide laws among the various states, no insecticide recommendations are specifically given here. All states prepare recommendations that are available to individuals through their county agent or state land-grant university or college.

How Insecticides are Sold

Insecticides are available in a number of forms such as dusts, granules, wettable powders and liquid concentrates. Dusts are finely ground powders of inert materials such as talc and clay with a low concentration of insecticide (0.5 to 10%). They are purchased ready-to-use and are easy to apply with hand dusters. While convenient for use in small gardens, dusts are less effective than sprays

George Taloumis

While an insecticide could have prevented caterpillar damage to this cabbage, few home gardeners are bothered by occasionally blemished harvests.

because of drift and the fact that they are easily washed off by rain. Dust should be applied in a light, barely visible but uniform deposit on all plant surfaces.

Granules are of much larger particle size than dusts and contain from 1 to 20% insecticide. Their main use is to kill soil insects such as grubs. They may be applied by hand from the container or with a fertilizer spreader.

Wettable powders are also similar to dusts except that they have an added ingredient that allows them to mix with water. They have a higher concentration of the insecticide (15-80 percent) than do dusts. They contain no solvents and are therefore safe to use on plants. Spray mixtures must be agitated frequently to prevent settling out of the powder and the clogging of nozzles. They are easy to measure out and store.

Liquid concentrates contain a high concentration (18-75 percent) of insecticide dissolved in a solvent. Other ingredients are added so that it will all mix with water. They are easy to measure out and apply but may cause injury to plants under certain weather conditions because of the solvents they contain.

All-Purpose Mixtures

No one insecticide will control all the different kinds of insects that may be present in a garden. Therefore, manufacturers prepare all-purpose mixtures of pesticides. They usually contain two or more insecticides that will control most insects and mites as well as one or two fungicides for disease control. These all-purpose mixtures are usually best for gardeners with small plots since they need purchase only one package. They may be formulated as dusts, wettable powders or liquid concentrates.

Natural Controls

Botanical or natural insecticides are derived from parts of a number of plants, mostly exotics, and are known collectively among professionals as botanicals. They are among the oldest of our insecticides and include pyrethrum, nicotine, rotenone, ryania and sabadilla. Nicotine, sold as nicotine sulfate, is dangerous if taken internally, but safe in ordinary garden usage. The others are considered safe to humans and pets, but may cause allergic reactions such as itching and sneezing in sensitive individuals. The botanicals have little residual effect so the period of protection they offer is very short. They were largely retired when the new generation of synthetic insecticides appeared in the 1940's, but have shown a resurgence with the increasing concern over environmental pollution. As with all insecticides, the label should be read carefully before use.

Non-Chemical Controls

Many people object to the use of chemical insecticides or wish to reduce the amount used. Some insect damage will result to unsprayed plants, but as home gardeners are not growing for the commercial market, lower yields and occasionally blemished produce are acceptable.

Here are a few tips to reduce insect damage in the home vegetable garden: It is helpful to diversify crops. Specific feeders may be troublesome but they have difficulty building up to pest proportions when only small amounts of their food crop are grown. After harvest, destroy all remaining plant waste by chopping or shredding and turning under in the soil.

This will eliminate over-wintering quarters for many insects.

Handpick large pests such as caterpillars and beetles. This is time consuming as it must be done daily to be effective. Handpicking is impractical in large gardens. Collars of metal foil or cut-down milk containers will give good protection against cutworms.

NATURAL CONTROL. Many people confuse the terms 'natural control' and 'biological control' as they are used by entomologists. Natural control is defined as the reduction or suppression of insect populations by the forces of nature, either physical or biological, without any direct action by man. Physical forces include adverse weather, climate and physical environment. Biological forces include parasites, predators, diseases and food supply.

Weather and climate are usually the most important factors in limiting the distribution and abundance of insects, although the biological factors can sometimes be more important in reducing insect populations. Natural control may often suppress some problem insects below pest proportions but rarely reach a satisfactory level of control for most important vegetable insect pests.

BIOLOGICAL CONTROL. Biological control is defined as the reduction or suppression of insect populations by means of living organisms encouraged or manipulated by man. It includes such means as the breeding and releasing of parasites and predators, and the use of diseases that affect insects.

Biological control, that is, utilizing other insects, is rarely successful under home garden conditions. Eggs or colonies of ladybird beetles, praying mantises, lacewing flies and other insects are advertised as putting an end to insect problems. What isn't stated is that some are limited in the kinds of insects they will eat and that others eat beneficial insects as freely as noxious ones. Praying mantises, for instance, will pounce on honeybees as readily as on cabbage butterflies. In any case, the majority may fly away soon after liberation. The home gardener who buys insect predators to solve his insect problems is likely to be disappointed.

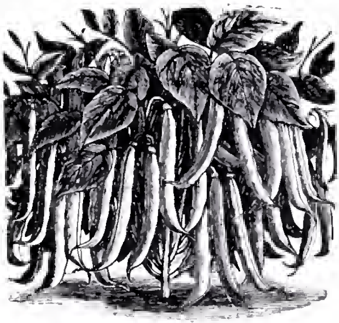
Biological control that is suited to use in the home garden is a bacterial spore disease known as *Bacillus thuringiensis* (B.T.). Highly virulent strains are available in commercial formulations under the trade names of Biotrol, Dipel and Thuricide. The spores are applied to plants as a dust or spray and are ingested by insect larvae in the process of feeding, with the result that feeding stops and the insect dies. B.T. is highly selective in that it is active against caterpillars but has little or no effect on mature insects. This is the control which is recommended to control the caterpillars of the gypsy moth. It is considered non-toxic to man, animals, fish and birds.

Pesticide Safety Tips

Read the label on each pesticide container before use. Follow instructions; heed all cautions and warnings.

Store pesticides in their original labeled containers. Store hormone-type herbicides away from pesticides. Keep all pesticides out of reach of children, irresponsible people and pets—preferably under lock and key.

Apply pesticides only as directed, and only to the crops specified in label instructions or by your agricultural authorities. Avoid inhaling sprays or dusts. Cover food and water used by pets. Do not smoke while spraying. Wash thoroughly when through. Follow the number of days between the last permissible spraying before time of harvest as listed on the label for each vegetable. ◆



A favorable environment, plus a virulent organism, plus a susceptible plant adds up to a disease

DISEASE CONTROL IN THE HOME VEGETABLE GARDEN

D. B. Schroeder

ALL vegetable plants are subject to diseases. The average home vegetable gardener may have only one or two different diseases to contend with during the growing season or he may encounter several dozen different diseases. These diseases may range from simple leaf-spots, which will not cause any appreciable damage, to extremely destructive wilts or rots which will kill the plant before a crop is harvested. Diseases vary in severity from year to year depending on environmental conditions, relative susceptibility of the host plant, and the abundance and type of causal organism.

Most plant diseases in the home vegetable garden are caused by parasitic organisms which derive their food by growing on plants. Common causes of disease are fungi, bacteria, nematodes and viruses. These pests can injure plants in many different ways. For example, some bacteria and fungi may interfere with the supply lines of the plant by clogging water-conducting cells and eventually cause the plant to wilt. Some fungi and nematodes can destroy the roots which furnish water and minerals to the plant. Other infectious parasites can cause flowers and fruits to rot, or spot the foliage and thus interfere with food manufacture.

A number of practices are generally required to keep diseases in check. The selection of seeds and plants is of paramount importance. When possible, varieties of plants recommended for your particular area of the country should be planted. Increasing numbers of varieties are being bred for resistance to disease. These should be chosen whenever possible. When purchasing plants, look for vigorous seedlings free of disease and insects.

If space permits, a crop rotation program should be planned and followed. The same or closely related crops should not be planted in the same area of the garden for three years or more to avoid diseases that may persist in the ground or in crop wastes.

Weed and insect control are essential parts of good garden keeping. Weeds may harbor insect pests and disease-causing organisms. Insects and mites are often vectors of disease.

Strict sanitation is another factor in disease prevention. All diseased plants or parts of plants should be collected and burned as soon as the disease symptoms are apparent. This is particularly important with virus-infected plants. In autumn, all clean plant debris should be plowed under or removed to the compost heap.

If clean, disease-free plants are desired, it is usually necessary to apply fungicides regularly. The majority of fungicides are protectants, not cures—that is, they must be present on the plant before the disease-producing organisms appear. Regular fungicide treatments are necessary when conditions such as prolonged rainy spells or hot, humid weather favor development of disease. Most fungicides break down rapidly and are ineffective after one or two weeks. Applications of fungicides should therefore be repeated at seven to fourteen-day intervals for optimum control of many diseases.

Most home gardeners find that a multi-purpose spray or dust will control a wide range of garden pests and diseases. The multi-purpose mixture will usually contain one or two insecticides, a miticide and a fungicide. These mixtures are very easy to use and generally quite safe when used as directed. Label directions should be followed closely. The home gardener should look for a multi-purpose mixture specifically labeled as safe for use on vegetable plants.

Protecting the home vegetable garden from a disease attack with fungicides does not require elaborate equipment. Manually operated dusters or sprayers are suitable for most home gardens. Small power sprayers and dusters are available for larger gardens. In general, sprayers will provide a more complete coverage of the foliage than dusters. Enough pressure should be used to drive the spray or dust into the center of the plant. Thorough coverage of all aboveground parts of the plant to the point of run-off is necessary for good control. When using a manually operated sprayer, it is advisable to agitate the mixture to keep the fungicide from settling out in the tank.

Only the rate recommended for a particular fungicide should be used. Exceeding the recommended rate could result in injury to the plant or a build-up of toxic residues on the edible parts of the plant. If less than the recommended rate is used, poor control may result.

A sprayer used to apply fungicides and/or insecticides should never be used to apply weed killers. It is nearly impossible to remove all traces of herbicides from a sprayer, and even minute amounts will damage or kill sensitive plants. If any chemical weed controls are planned, it is imperative to have a second sprayer plainly marked and kept exclusively for this use.

A description of some plant diseases common to most vegetable gardens follows.

Damping-off

This is one of the most destructive disease problems found in the home garden. One of several fungi originating in the soil or on the seed coat can be responsible. There are essentially three types of damping-off.

1. Preemergence damping-off in which the seeds are killed before germination or soon after. The young plants never emerge from the soil.
2. Postemergence damping-off in which the stem of the young plant is invaded near the soil surface. The seedling wilts, the stem collapses and the plant topples over.
3. Wire-stem damping-off. Seedlings that have been hardened off may be attacked by damping-off organisms. Stems are partially girdled, discolored and wire-like in appearance, hence the name wire-stem.

Seeds should only be planted in light, well-drained, sterilized soil or soilless mix. Overwatering and overcrowding should be avoided. Too much fertilizer, particularly nitrogen, can promote disease. All seeds should be dusted with a fungicide before planting.

Powdery Mildew

The most characteristic symptom of this disease is a superficial white to light gray, powdery coating on the leaves or young shoots. Leaves may be curled and very often turn yellow, wither and die prematurely. Powdery mildew is particularly destructive on cucumbers, melons and peas.

The disease is most common when cold nights follow warm days and in areas where air circulation is poor.

Resistant varieties of certain vegetables are available. Overcrowding and damp, shady locations should be avoided. Plants should be watered early in the day so they have a chance to dry off before nightfall. Several fungicides are available for control of powdery mildew. Since most multipurpose mixtures usually do not contain a fungicide effective against powdery mildew, it may be necessary to add an additional material if mildew is a problem.

Downy mildew is entirely different from powdery mildew. After some experience, the gardener will be able to tell the two apart. Leaves infected with downy mildew usually show irregular spots of pale green or yellow on the upper surface of the leaves. The spots on the undersides are typically light gray or purplish and downy. Affected leaves eventually wilt and die. Under very favorable conditions for spread of the disease, all plant parts become infected.

Most vegetables are susceptible to downy mildew. The disease is most severe in cold, wet or very humid weather.

The use of resistant varieties, crop rotation and sanitation have been recommended. Avoiding overcrowding, excessive nitrogen fertilization and sprinkling the foliage of plants. Under optimum conditions for disease development, it may be necessary to spray at five-day intervals.

Foliage, Fruit and Root Diseases

A number of fungi and bacteria attack the leaves and fruit of practically all vegetables. The first symptoms are usually small spots on the fruits or foliage. Color, shape and size of the spots vary, depending on the causal organism. Spots will often enlarge and merge. Occasionally whole leaves and fruits may be affected and entire plants may die prematurely. Large irregular blotches or an extensive blight may develop on the foliage. Infected fruits may completely rot. Foliage and fruit diseases are favored by wet, humid seasons and by water splashed on the foliage.

A regular fungicide program is usually necessary to control most of the foliar and fruit rot diseases. Overcrowding of plants should be avoided. Control of insect pests which cause wounds through which parasitic fungi enter will help control many of the foliage diseases. Rotted fruit should be collected and disposed of immediately. Vigorous plants are less likely to be damaged.

Plants affected by root diseases usually die more gradually than do those affected by other agents. Diagnosis of root rot disease is difficult because the affected portion is hidden. Generally, plants will be yellowed or light green in color and stunted. Severely affected plants may wilt and collapse. Roots are often soft and decayed. Root diseases are most severe on wet, poorly drained soils. In the southern states, nematodes may be present in high enough numbers to cause serious injury to the roots. In some areas, nematodes contribute to the root disease complex by making wounds in the roots through which root rot fungi can enter the plant.

Disease-free transplants should be planted in well-drained fertile soil. A system of crop rotation should be practiced if possible. Close cultivation and overcrowding of plants should be avoided. Some root disease problems can be prevented by collecting and destroying all plant debris in autumn. In those areas where nematodes are a problem, soil fumigation should be conisdered as a means of control. Information on control by means of soil fumigation is available in most states from county agents.

Virus Diseases

Symptoms caused by viruses are extremely variable. Leaves often are mottled with light and dark areas in a mosaic pattern. Infected leaves are distorted, often puckered and needlelike. Entire plants may appear stunted and bushy. Fruits may be deformed and fewer in number than on healthy plants. Symptoms may be confused with those caused by severe nutrient deficiency.

Use resistant varieties of plants if they are available. Infected plants should be removed from the garden and destroyed. Insects, particularly aphids, should be controlled with insecticides since some virus diseases are spread by insects. A serious virus disease of several plants, particularly tomato and pepper, can be brought into the garden on the hands of people who use tobacco. Gardeners should always wash their hands with soap and water before working in the garden and should avoid using tobacco when working with these plants. Weeds should be controlled in the garden and all plant debris should be cleaned up in the fall. ◆

Steps toward adulthood

THE CHILDREN'S VEGETABLE GARDEN IN BROOKLYN

Frances M. Miner

LAST summer, as usual, was a good one for radishes in Brooklyn, the largest of New York City's five boroughs. In one home, 600 of them were proudly served raw, hopefully baked and even frantically fried. They were given away to appreciative (and sometimes reluctant) neighbors until finally the ardent young gardeners of the household were begged, "please don't bring home any more radishes."

The youngsters were among the more successful tillers-of-the-soil in the Children's Garden of the Brooklyn Botanic Garden where, for nearly 60 years, there has been a program to introduce city children to the world of plants. This combined educational and recreational plan operates as a loosely-organized boys' and girls' club, with presiding officers. Children enroll in this leisure-time activity because they are interested or curious. The ones who like the program and who really want to come continue for years.

The Botanic Garden is not connected in any way with the schools of the city, but many students of the Children's Garden report that the knowledge gained through their activities at the Botanic Garden has been helpful in their school work.

It is not always easy for a nine-year-old to succeed. Last year a little boy kept picking the flowers off his tomato plants so they would not interfere with the tomatoes! The harvest may not be the chief aim of the program, but it surely is for the students. It is rewarding to the instruction staff to see the children carry home hundreds of pounds of fresh vegetables and be richer for the doing.

While New York City is not so devoid of trees and other vegetation as out-of-town visitors sometimes think, it is admittedly a somewhat less than ideal place for observing nature. And for most of the children a summer experience in the garden is their first opportunity to watch a plant grow and develop from a seed.

The Children's Garden is not the result of a casual experiment. On the contrary, the genesis of the garden lay in both the spirit of the founders of the Brooklyn Botanic Garden and in the legal language of its charter—"to provide for the instruction of the people." The earliest plans of the founders and trustees of the Garden called for children's education in the field of applied botany.

When the Children's Garden was laid out in 1914 it was the first in the world under the guidance of a botanical garden. The philosophy behind the garden and the approach to the children were so simple and straightforward that the program has changed little over half a century and the garden has served as a model for similar children's gardens throughout the United States.

Basically, the program consists of early spring classroom and greenhouse instruction and work, followed by the actual cultivation of individual outdoor gardens. Woven unobtrusively but firmly into this training is training of another sort—learning to get along with people, to respect the rights and property of others, to assume responsibility for jobs that must be done and to give of one's self through service to the Botanic Garden.

As indicated, the children's gardens are vegetable gardens. Vegetables were chosen in the very beginning because they met three basic requirements—a variety of vegetables provides a greater range of examples of plant growth than flowers,

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Adapted from the JOURNAL of the Royal Horticultural Society (Vol. 89).

Roche

This young gardener has a sack filled with scallions and other vegetables to take home. They were grown by him in the Children's Garden at the Brooklyn Botanic Garden.

many kinds grow quickly (children are impatient and must see fast results) and they provide a substantial and tangible reward for a child's labor. It is interesting to note that over the years the children themselves seem instinctively to prefer vegetables. Even youngsters attending the garden for the first time almost invariably talk about vegetables rather than flowers.

The varieties to be grown are chosen on the basis of their adaptability to the growing conditions in New York City, and are especially selected to produce a wide assortment of crops which can be harvested almost continually during the summer gardening season.

The younger gardeners must plant a prescribed selection, including radishes, cabbages, beans, lettuce, beets, onions, carrots, tomatoes and scallions. More advanced gardeners may lay out their own plots, using a choice including these vegetables plus broccoli, cucumber, egg plant, celery, corn, parsley, peas, Swiss chard and squash.

The garden courses begin in February when children who have had a year or so of previous experience in the garden, attend a series of four or five Saturday-morning classes. They draw up the plans for their gardens, study plants, and plant the vegetable seeds that are to assure their early summer harvest. The February group is then on furlough until outdoor work begins in late April.

A second group is then invited to attend another set of Saturday classes. These youngsters are all beginners, chosen from the list of applicants who have been interested enough to send in their names during the year. The rolls are open to any pupil (nine years of age, or over) in public or private schools; last year 123 schools were represented. These boys and girls are put through a sort of orientation program in which they study and plant seeds, handle tools and learn how to use them, see the plan for their gardens and write the labels that will mark the rows.

The climax of the spring sessions is Planting Day, which marks the transition from greenhouse and classroom work to actual gardening. Everyone hopes for a sunny Saturday. The youngsters parade from the Botanic Garden administration building to the one-acre Children's Garden area. The smallest who is invited to

Daphne S. Drury

Springtime *(above)* and summer *(below)* views of a circular vegetable garden in the Children's Garden section. Such imaginative arrangements can be duplicated in backyards where appearance is important and space is limited.

Marjorie J. Dietz

be the "mascot" for the day rides in style—in a wheelbarrow.

The younger children plant their gardens in 8-by-10-foot plots; the older gardeners have 10-by-11-foot plots. Older gardeners are delegated to help the newcomers lay out their gardens, transplant the seedlings and generally help supervise a busy morning. Later, when the older group plants its gardens, the younger children volunteer to help as they can.

There are 135 garden plots laid out side by side in the "South Field" of the garden and 65 in the "North Field." Two children work on each plot as partners. With a path only 18 inches wide separating the plots, the youthful farmers soon learn the necessity of co-operation and the value of consideration for others. It happens every year, but the Botanic Garden staff is still pleasantly surprised each summer at how quickly the youngsters learn to stay on the paths and co-operate with one another.

In naming partners for a plot, the instruction staff will permit friends of the same sex to work together or will pair strangers of similar age and experience. The occasional disagreements, the staff has discovered, arise not between the strangers, but most often between girl friends who have asked to be allowed to work together.

There is a rather wide social, economic and racial range represented in the Children's Garden, but the youngsters work together without friction. There are, of course, occasional arguments, but no battles—this is a basic understanding of the children and their parents. One staff member says "the reason for this is that the children who come here want to participate and are interested in what they are doing. The ones who get bored simply stop coming; they are not forced to remain, so there is no reason for them to become discipline problems."

This respect for the rights and property of others carries over into the children's care of the tools provided by the Botanic Garden and in the care of the Children's Garden House. So careful are they that some of the rakes and hoes used today were purchased in 1917.

Saturday mornings during May and June find the Children's Garden a veritable beehive of activity. Half of the 300 gardeners come to class at 8:30 A.M., the

Roche

Two children work in each plot as partners and soon learn the necessity of co-operation and the value of consideration for others.

other half at 10 o'clock. Six or seven adults assisted by several teen-aged junior staff members direct operations in the two fields, keep records in the Garden House, meet parents and visitors, see that crops are harvested on time and that weeds or other rubbish and tools are picked up at the end of the class periods. The spring schedule hardly keeps pace with the week-to-week changes in the plants, especially if a rainy day interferes with a session. The instructors, I ought to mention, are young women who have majored in botany or horticulture in college; they often find their young charges delightfully exasperating.

"You sometimes wonder just what they learned in spring classes," said one instructor. "Occasionally there is a youngster who knows all the practical things—how far apart to plant cabbages, for example, but ask him why the cabbages were planted first in the greenhouse, then transplanted to the outdoor garden, he's likely to answer 'because that's the way you plant cabbages.' "

Or, says another instructor, "as the plants mature for harvest, the children are happy to pull up radishes or pick tomatoes, but they will come to us with about six beans and say, 'this is all I could find.' " We have to show them the beans hidden under the leaves (they knew they were there), and see to it that they are picked. Bean-picking is obviously less rewarding to children than picking tomatoes.

As soon as the city schools close for the long summer vacation and the children have more leisure time for gardening, Botanic Garden classes shift to a weekday schedule. Monday, Thursday and Friday mornings are reserved for the younger children, and Tuesday and Friday mornings for gardening days. Children continue to arrive for 8.30 or 10.15 gardening hours, but with only part of the enrollment in attendance at a time, summer mornings are more leisurely and the three or four instructors can give students individual attention. Many youngsters never miss an appointment unless their families go away from the city on a holiday. In fact, parents sometimes complain that family plans have to be arranged around a pending harvest in junior's garden.

To widen the scope of summer activities and to add interest to the routine work, a series of study and service projects is offered to gardeners who choose to undertake them. Younger children start the first step in the second summer of attendance, but junior and senior high school students may take the first step their first year. Special classes are held on Wednesday mornings, and all who show meritorious effort and accomplishment are awarded ribbons or medals at an annual "Honor Day" in the autumn. This is the full-blown junior equivalent of a university commencement. An able and ambitious student competes less with others than with himself in trying to complete the list of requirements for the award. "Extra work" is a part of each step and may include any of the chores which are important in the maintenance of the permanent and decorative plantings that surround the Children's House. Weeding, raking paths, tying up climbing roses, cutting old flower heads, taking rubbish to the dump are some of the many tasks. Both the amount and the kinds of work vary with the age and experience of the candidate.

The idea of "service" is not restricted to those in the awards program. All the young gardeners are encouraged to help in whatever chores need to be done in the children's areas or in special tasks for the Botanic Garden at large. Washing small pots for the instruction greenhouses, stuffing and sticking an unexpected summer mailing to the Botanic Garden's Membership Society, or unpacking a shipment of terra cotta and ceramic containers from Japan are examples of the "real work" these youngsters do for the Botanic Garden, and what is more, find pleasure and satisfaction in the doing.

Not all of the students enrolled in the spring garden stay for the summer. Many go away from the city for extended vacations or to camps in rural areas. To take over the gardens left by these young

BROOKLYN BOTANIC GARDEN
CHILDREN'S GARDEN

Plan for 8 ft. by 10 ft. Garden (Scale: ½ in. = 1 ft.)

West Side—Annual Border

10 feet

8 feet						8 feet
6"			Red Radish			6"
9"	X	X	Cabbage	X	X	9"
12"			Beans			12"
12"			Beets			12"
9"			Onions			9"
9"			Carrots			9"
9"	X	X	Tomato	X	X	9"
12"			Lettuce			12"
6"			White Radish			6"
6"			Scallions			6"
6"						6"

10 feet

East Side—Rose Fence

Vegetable	*Variety*	*Planting Directions—1 pkt. seed/row*
Red Radish	'Cherry Belle'	Sprinkle seeds evenly over *entire* row; ½ in. drill
Cabbage	'Golden Acre'	1 plant every 18 in.; 15 in. at ends; terrachlor and Hotkaps needed
Green Beans	'Contender'	2 seeds every 4 in.; 2 in. drill
Beets	'Ruby Queen'	1 seed every 1 in.; 1 in. drill
Onions	'Yellow'	1 "set" every 3 in.; 4 in. drill
Carrots	'Pioneer'	Sprinkle seeds evenly over *entire* row; ½ in. drill
Tomatoes	'Burpee VF Hybrid'	Plant in May; 2 ft. apart
Lettuce	'Buttercrunch'	Small pinch of seeds (about 5) every 4 in.; ½ in. drill
White Radish	'Icicle'	Sprinkle seeds evenly over *complete* row; ½ in. drill
Scallions	'Yellow'	1 "set" every 2 in.; 4 in. drill

BROOKLYN BOTANIC GARDEN
PLANTING DIRECTIONS FOR CHILDREN'S GARDEN

Vegetable Varieties	*Distance between rows (in.)*	*Planting instructions (1 pkt. of seed to a row)*	*Days from Seeding*
Bean—'Tendercrop' (green)	12	2 in. drill; 2 seeds every 4″	53
'Royalty Purple Pod'	12	2 in drill; 2 seeds every 4″	51
'Cherokee Wax' (yellow)	12	2 in. drill; 2 seeds every 4″	52
'Kanrich' Soy Bean	12	2 in. drill; 2 seeds every 4″	103
Beet—'Ruby Queen'	9	1 in. drill; 1 seed every 1″	60
Broccoli—'Green Comet'	12	6 plts., 15 in. fr. ends; 1 ev. 18″ terrachlor & cut Hotkaps needed	55
Cabbage—'Golden Acre'	12	6 plts., 15 in. fr. ends; 1 ev. 18″	64
'Red Acre'	12	6 plts., 15 in. fr. ends; 1 ev. 18″	76
Carrot—'Pioneer'		½ in drill. Sprinkle thinly.	67
'Goldenheart'		Radish seeds to mark row.	70
Corn—'Butter & Sugar'	18	2 in. drill; 3 seeds every 12″	78
'Spring White'	18	2 in. drill; 3 seeds every 12″	66
'Sprite'	18	2 in. drill; 3 seeds every 12″	69
Cauliflower—'Snow King Hybrid'	12	See broccoli.	50
Cucumber—'Crusader'	18	3 hills, 8 seeds in each; cover	51
'Galaxy'	18	seed at least 2″; uncut hot kap	52
'Princess'	18	over each hill.	60
Eggplant—'Black Magic'	12	4 plants, 1 every 2 feet	72
Kale—'Blue Curled Scotch'	12	See broccoli.	55
Lettuce—'Greenheart' (looseleaf)	6	½ in. drill; 5 seeds every 4″	45
'Oakleaf' (looseleaf)	6	½ in. drill; 5 seeds every 4″	40
'Ruby' (looseleaf)	6	½ in. drill; 5 seeds every 4″	47
'Summer Bibb' (head)	6	½ in. drill; 5 seeds every 4″	62
Onion—'Yellow' sets	6	4 in. drill; 1 bulb every 3″	90
Parsley—'Perfection'	9	2 ft. at end of some other row	75
Pepper—'Staddin's Select'	12	See Eggplant.	72
Radish—'Cherry Belle'	6	1 in. drill; sprinkle thinly	24
'Icicle'	6	*over entire row.*	30
Scallions—'Yellow' onion sets	6	4 in. drill; 1 bulb every 2″	**
Swiss Chard—'Lucullus' (green)	9	1 in. drill; 1 seed every 3″	60
Squash—'Hybrid Zucchini'	18	See cucumber.	50
'Seneca Prolific' (yellow)	18		51
'St. Pat's Scallop'	18		50
'Vegetable Spaghetti'	18		?
Tomato—'Burpee VF Hybrid'	12	See eggplant	72
'Heinz 1350'	12		75
'Roma' (Italian)	12		75
'Small Fry' (cherry)	12		63

(*Continued*)

vacation-bound city farmers, another beginners' class is organized and a sort of "second shift" is permitted to sign up for July and August. This is why the vegetables are so carefully chosen. The early group gets radishes, lettuce, spinach, cabbage and perhaps beets and string beans. The summer gardeners harvest tomatoes, peppers, egg plant, corn, cucumbers and summer squash. There are no prizes for the biggest or the best, but each gardener weighs or counts his harvest and faithfully records it each day in the "Crop Book." Year-end summaries are fairly impressive. Among the best for 1971 were more than half a ton each of cabbage, 500 lbs. of summer squash and cucumber, more than a ton of tomatoes, 9,000 carrots and 16,000 radishes.

While home gardens in the New York area continue to yield well into autumn, the Children's Garden is cleared and closed by the end of August. As mid-season harvests leave rows vacant in the gardens, the youngsters begin planting rye-grass to keep down weeds. During the last week of classes even the paths that separate the beds are spaded and planted with rye-grass which makes a fine, green cover crop to be ploughed under in November.

The Botanic Garden charges small fees for the courses—$3.00 for the spring Saturdays, February through June, or for the July-August period. Students who expect to attend for the whole season pay $5.00. The older students, incidentally, are pleased to handle much of the paper work at registration time.

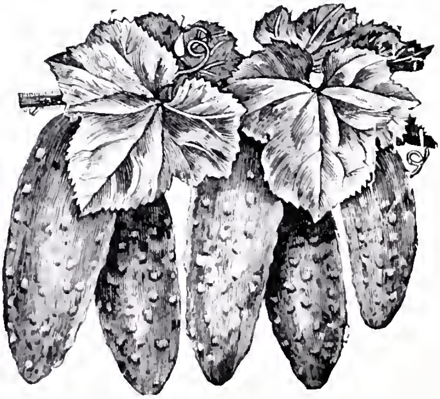
Many of the registrants each year are "old-timers"; most years at least 60 per cent of the gardeners are repeaters from the year before. Some children register when they are nine years old (the minimum age limit) and remain through high school. Many spend three or four years in the garden, and a few represent the second or third generation of a family that has worked in the Children's Garden.

While the instructors will work personally with a youngster who shows unusual interest in botany, the Children's Garden was not designed as a "preparatory school" for botanists, although, down through the years, a number of the children have eventually made their professions in that or related fields.

The Botanic Garden is proud of these professionals, but it is just as proud of the thousands of children who have worked hard many summers, "graduated" to adulthood, and then return to the Botanic Garden throughout their lives to enjoy the beauties and wonders of nature.

These are the people who, through their work in the Children's Garden, have taken a step in the direction of the couplet cut in stone over the door of the Children's Garden House:

"He is happiest who hath power
To gather wisdom from a flower."
Mary Howitt—1847



INDEX OF VEGETABLES

Arugula, 32
Asparagus, 60
Asparagus Lettuce, 69

Beans, 18, 53
Beets, 18, 56
Broccoli, 19, 71
Brussels Sprouts, 19, 71

Cabbage, 21, 71
Carrot, 21, 57
Cauliflower, 71
Celeriac, 68
Celtuce, 69
Chinese Cabbage, 71
Chives, 81
Collards, 34
Corn, see Sweet Corn
Cress, 32
Cucumber, 20, 75

Eggplant, 20, 21, 36

Florence Fennel, 64

Garlic, 81
Girasole, 67
Greens, Turnip and Beet, 34

Husk Tomato, 64

Jerusalem-artichoke, 67

Kale, 34
Knob Celery, 68
Kohlrabi, 66, 71

Leek, 81
Lettuce, 20, 21, 31

Muskmelon, 22, 75
Mustard, White, 32

New Zealand Spinach, 34

Onion, 79

Parsley, 32
Parsnip, 57
Peas, 20, 22, 53
Pepper, 20, 36
Potato, 42
Pumpkin, 76

Radish, 20, 59
Rhubarb, 62
Rocket Salad, 32
Roquette, 32
Runner Beans, 70
Rutabaga, 58

Salsify, 57
Scarlet Runner Bean, 70
Shallot, 81
Soybean, 55
Spinach, 34
Squash, 20, 22, 75
Sweet Corn, 19, 21, 29
Swiss Chard, 34

Tomato, 20, 22, 36
Turnip, 58

Vegetable-oyster, see Salsify

Water-cress, 65
Watermelon, 22, 75

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—planting dates
—varieties
—fertilizer recommendations

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BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

A HOUSE PLANT PRIMER

- How to Grow African-violets & Avocado & Gardenia & Bromeliads & Poinsettia & Christmas Cactus & Others
- Decorating with House Plants
- Terrariums
- Where-to-buy Directory

AUTUMN
1972

NEW SERIES
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CONTENTS

Repotting a House Plant .... *George Taloumis* Cover
A Contemporary Plant Room .... *George Taloumis* 2
Letter from the Brooklyn Botanic Garden 3
A Winter Garden Indoors .... *Montague Free* 4
A Checklist—House Plant Problems .... *Daphne S. Drury* 9
House Plants for North Windows .... *Mollie Harker Rodriguez* 10
Herbs in a Kitchen Window .... *Elsa Huntley* 13
To Water or Not to Water .... *Lois Beckett Himes* 15
Questions and Answers on House Plants .... *Edmond Moulin* 17
Three Ever-popular House Plants
  1. African-violet .... *Frances Miner* 20
  2. The Avocado .... *Nancy Shopis* 22
  3. The Gardenia .... *Loretta Wohlt Hodyss* 24
English Ivy .... *Thomas R. Hofmann* 27
House Plants as Decoration .... *Barry Ferguson* 31
Poinsettias in the Home .... *Conrad B. Link* 40
Windowsill Orchids—A Retrospective .... *Brenda Weisman* 42
The Christmas Cactus .... *Frank Bowman* 44
Growing Bromeliads Indoors .... *George Kalmbacher* 46
How to Grow a Pineapple .... *United States Department of Agriculture* 49
A Terrarium Can Become a Miniature Woodland .... *Elsie T. Hammond* 50
New Looks and New Ways of Terrariums .... *Marjorie J. Dietz* 52
House Plant Primer—Basic Care at a Glance 54
House Plant Pest Control .... *Anne Birdsey Ginns* 58
Terrariums—A Poem .... *Brenda Weisman* 60
Board Your House Plants in the Family Bathtub .... *Robert S. Tomson* 61
Further Readings on Selection and Growing of House Plants .... *Elizabeth C. Hall* 62
Mail-order Sources for House Plants *Mary Jane Connors* and *Frederick McGourty, Jr.* 63
House Plant Societies .... Inside Back Cover
An Encyclopedia for Indoor Plant Growers .... *Marie Giasi* Inside Back Cover

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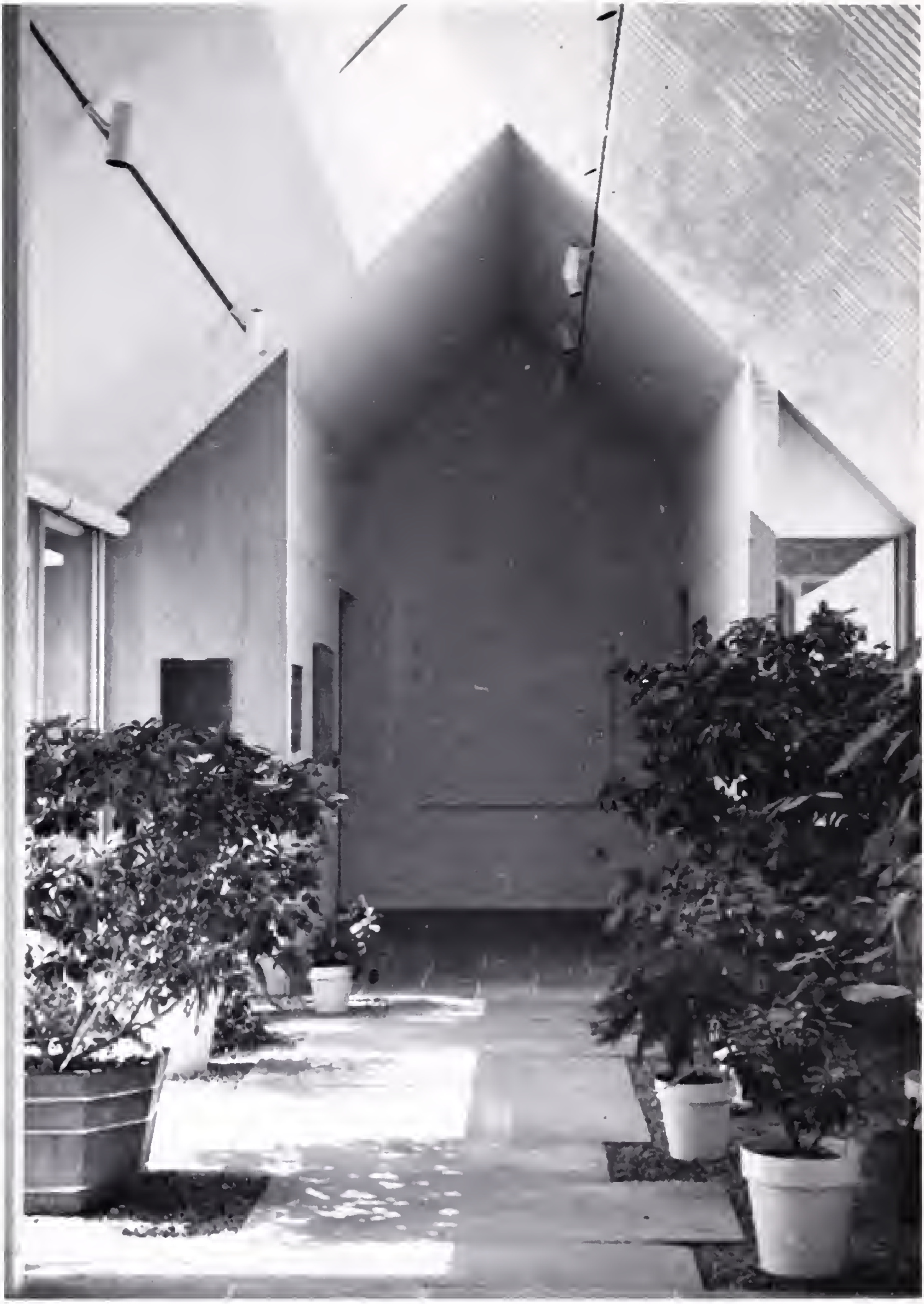


George Taloumis

The contemporary plant room. More and more modern houses contain such special accommodations for house plants. The plant or garden room is today's version of the Victorian conservatory or lavish bay window. (For another view of this plant room, see page 32. Additional decorating ideas are found on pages 31-39.)

LETTER FROM THE BROOKLYN BOTANIC GARDEN

Windowsill horticulture is the most frequent topic of talk these days among home growers who seek out the Botanic Garden for advice on plants. With more people than ever living in apartments and small homes, it is clear that house plants are "in." Perhaps the general concern with our natural surroundings has helped spur the hobby of growing plants indoors, too. The pervasive, unnatural chlorosis caused by our accelerating demands upon the outdoor environment may have no simple solution, but one, at least in most cases, can cope with the yellowing of leaves on the family's philodendron. Whether a person lives in Bedford-Stuyvesant, Shaker Heights or Haight-Ashbury, above all, there is the simple pleasure of growing and tending a living, green thing.

Most problems with house plants occur when we forget that they are indeed living things and have certain basic requirements. The purpose of the **HOUSE PLANT PRIMER** is to answer the questions most often asked of our Plant Information service over the years. In this connection, readers will notice that, unlike most other Handbooks in the **PLANTS & GARDENS** series, this is largely a Brooklyn Botanic Garden staff issue. In fact, twenty of the twenty-three Contributors have served on the staff of the Brooklyn Botanic Garden at one time or another.

Because this issue is primarily concerned with the fundamentals of house-plant growing, it might be appropriate to mention a few related but more specialized Handbooks. **HOUSE PLANTS**, in the series, is a "hardy perennial," and this issue is intended to complement it. Others of particular interest are **SUCCULENTS, AFRICAN-VIOLETS AND THEIR RELATIVES, ORCHIDS, GARDENING UNDER ARTIFICIAL LIGHT**, and **GREENHOUSE HANDBOOK FOR THE AMATEUR.**

A question often asked of staff members is: "How long does a house plant live?" There is no rule of green thumb, for some begin to go to Elysian pastures rather early, especially if their cultural requirements are neglected. Most, of course, have a short life span compared with a tree in the garden. However, be heartened by the report of Frances Dämm, Secretary of Publications. The same aspidistra has been in her family since at least 1892, although she admits that it has been divided five or six times over the years.

May the **HOUSE PLANT PRIMER** help your plants live longer and add to your pleasure in cultivating a garden indoors.

Frederick McGourty, Jr.

Editor

The care of house plants

A WINTER GARDEN INDOORS

Montague Free

IT SEEMS that the farther north one goes in Norway the more extensive is the cultivation of house plants and the more profound the love for plants in the home. The implication to be derived from this statement is that the more rigorous the climate the greater becomes our need for indoor plants to cheer us with their beauty and to remind us that the "good old summer time" will come again. The North American climate is also sufficiently severe in the winter to provide the gardener with an incentive for making a winter garden indoors.

The extent to which such a garden will be successful depends largely upon the facilities available. If you have sunny windows and do not maintain the temperature of your house at too high a point—68°F. is ample—the possibilities for a successful garden are practically unlimited. If you have some means of humidifying the air in the house, your health will benefit and the chances of success with any plants you may have will correspondingly increase. If, on the other hand, your rooms receive but little sun and a temperature is maintained that ranges from 75° to 85°F. with a corresponding drop in humidity, you must restrict yourself to the plants that are tough and resistant to such adverse conditions. In this group few of the so-called flowering plants are found, and the gardener must rely largely on such material as snake-plants, aspidistra, dracena, palms, and cacti.

When planning your winter garden, you can adopt one of three schemes for handling and displaying the plants. They may be grown in pots and arranged as artistically as possible on the windowsill or on a plant stand near the window. The second method involves the use of window boxes that approximately fit the window space. The boxes are filled with soil in which the plants are set out. A third possibility is to grow the plants in pots and display them in window boxes, partially filled with moist peat moss in which the pots can be plunged. There are many advantages claimed for this system. It allows the plants to be artistically displayed without having their pots too much in evidence. Sickly plants are easily removed and replaced with others without disturbing the roots of the remaining healthy plants. The moist peat moss around the pots maintains an equable water content in the soil and makes it easy to keep the plants healthy.

Setting the plants directly in the soil of a window box has its advantages when the plants grown are permanent and when an attempt is being made to grow vines, such as English ivy, to train around the window frame.

When plants are to be grown in pots, it is advantageous to make use of a shallow, water-tight tray constructed to fit the windowsill. This tray should be filled with small pebbles on which the pots may stand, and water must be maintained in the bottom of the tray. Such a contrivance will take care of drainage water from the pots, and the evaporation of water that takes place will help in a small measure to overcome the dryness of the air.

Most of the flowering plants suitable for blossoming in the house during the winter belong in the group known as "spring-flowering bulbs," those which are forced so that they will produce their flowers at intervals from January to April. There are, however, a number of old standbys among the non-bulbous plants that may be relied upon. These include the geranium, the wax begonia, and several other varieties of begonia, the calla-lily, freesia, Zanzibar balsam, Christmas and crab cactus, cyclamen, and

Many of the house plants suitable for bloom during the winter belong in the group known as "spring-flowering bulbs." Especially light and delicate—and deliciously fragrant—is the hyacinth variety 'Snow Princess' which blooms in mid-winter.

Photographs by Marjorie J. Dietz

Chinese primrose. The "poison" primrose is also a good house plant, but some persons get a rash from handling it similar to the rash caused by poison-ivy.

Why is it that some of us have such poor success with our indoor gardens? The chief reason for their failure is that they are frequently kept in rooms that are too hot. In cool country houses that lack the amenities of modern heating systems, there is no great difficulty experienced in growing plants in the home. Keep your plants as cool as is possibly consistent with your own comfort, give them all the light available, water only when the soil begins to dry out and then water thoroughly, and most of your house plant troubles will be things of the past.

The Japanese camellia and the Indian azalea are plants that thrive under cool conditions. They can stand the temperature when it drops to 40° F. or even to 35°F. If you have a sun porch that is unheated, grow plants such as those and bring them into the house only when you think the temperature on the porch is likely to go below the freezing point. English ivy, too, will thrive under such conditions and, of course, will survive freezing.

Considerable reliance should be placed on spring flowering bulbs, for they will help a continuous bloom. You can purchase bulbs of tulips, hyacinths and daffodils in the fall, plant them in pots which can be plunged in the soil. Then bring a few pots of bulbs indoors from your outdoor plunge pit at intervals of two or three weeks, starting about Christmas time. (Or you can buy the potted bulbs from a florist.) Do not try to force the bulbs into bloom too quickly, for rapid forcing is the commonest cause of blasted flower buds. Keep them for two or three weeks in a temperature of about 50°F: they can then be exposed later to a temperature of 65° or 70° without injury to the flower buds. (See pages 65-76 of the Handbook on HOUSE PLANTS for complete instructions on forcing spring bulbs. The rear cover of this handbook gives ordering information.) When the flowers have withered, the bulbs should be removed from the winter garden, for their ripening foliage is unsightly. Either discard them or place them in the spare room where they are exposed to the light:

they may then be watered until the leaves have turned completely yellow. Then withhold water until the fall, when the bulbs may be planted in the outdoor garden with the expectation that in a year or two they will blossom again. Do not attempt to use forced bulbs for forcing two years in succession.

Pest Control

And now a word or two regarding the insect pests that may possibly bother the winter garden—scales, mealy bugs, red spider and plant lice. What shall be done to prevent their attacks? The Saturday night bath is a world-wide institution. Establish a Saturday-morning bath custom for your house plants and you will find that it is the best measure you can use to keep them free from severe insect attacks. A spray of clear water, properly applied, is very efficacious in upsetting the domestic arrangements of most of the insect pests. Place the plants on their sides in the bathtub and spray both upper and lower surface of the leaves with water from the hose, using it with sufficient force to dislodge the insects and wash them down the drainpipe but not so forcibly as to injure the foliage. If your plants are blossoming, keep the water away from the flowers as much as possible unless they, too, are infested. The advantage of growing plants in individual pots is now apparent, for using this method it is easy to control any insects that may have infested them. If it is not convenient to remove the plants to the bathtub or to some place where the water may be used freely, one must have recourse to a contact insecticide of some kind. Use either nicotine-soap solution or one of the many proprietary insecticides, and spray the plants or dip them, whichever is more convenient.

The secrets of success in winter gardening may be summarized as follows: Keep the plants cool and the air humid; provide an abundance of light; give careful attention to watering; take prompt

A pot or two of freesias are worth growing in the winter garden if only for their sweet scent. But beware! Some modern freesia varieties are scentless—their fragrance having been sacrificed for larger flowers in flamboyant colors.

action when insect pests are discovered; and select the right kind of plants for your conditions.

Repotting and Dividing

A common question concerning an ailing house plant is: "What kind of soil should the plant have?" Yet in most cases the plant is ailing because of unsuitable atmospheric conditions, improper watering or insect or disease problems, rather than a need of repotting. Plants do need repotting occasionally, however, sometimes because they are growing vigorously and have become potbound, sometimes because the soil has become water-logged and sour, and the roots, as a consequence, are unhealthy.

Several varieties of the plants commonly grown in the house, such as pandanus, sansevieria, and palms, seem to thrive better when their roots are somewhat crowded. These plants should not be moved into larger pots unless their roots are so crowded that growth is no longer healthy and vigorous. Instead of repotting, remove as much soil as possible from the surface without disturbing the roots of the plants and replace it with a rich mixture made up of equal parts of sandy loam and thoroughly decayed manure. For azaleas and camellias, which require an acid soil, add one-third or one-half of peat or peat moss to a sandy-base soil. Supplemental feeding of a complete commercial fertilizer, containing nitrogen, phosphorus, and potash, may be given at the rate of a level teaspoonful to a 6-inch pot or according to directions on the package. If the plant is healthy and growing vigorously this fertilizer should be applied to the surface of the soil every three or four weeks and scratched in.

The pots to be used in repotting must be washed clean inside and out and should not be very much larger than the pot in which the plant is growing. For sizes up to 6 inches, one half-inch clearance between the ball of soil and the inside of the pot is usually adequate. For sizes over 6 inches, allow 1 to 1½ inches clearance.

Put a piece of a broken pot, concave side down, over the hold in the bottom of the pot and upon it place a thin layer of broken pot to provide drainage. Place the new soil, which should be neither wet nor dust dry, on the work bench or table and you are ready to start operations.

The geranium is an old standby among indoor flowering house plants and performs best in a cool, sunny window.

Remove the plant from the old pot by turning it upside down and tapping the rim of the pot on the edge of the bench. Remove the old drainage material at the base of the plant if it can be done without injury to the roots. If the roots are greatly matted around the outside of the ball of earth, it is a good plan to loosen them by means of a pointed stick, taking care not to break the roots too much in the process. Any loose soil on the surface of the ball should be removed before placing the plant in the new pot. Having prepared the plant for its new quarters, place a handful of partially decayed leaves, from which the fine material has been sifted, over the drainage in the bottom of the pot. Follow this with a handful of the prepared soil and place the plant in position. It should be planted deep enough to bring the top of the old ball of earth about one inch below the rim of the pot. Be sure to get the "ball" in the center of the pot. When it is placed to

One way to increase humidity is to stand pots in shallow, pebble-filled trays that are filled with water.

your satisfaction, fill it in with soil, occasionally jarring the pot upon the bench to shake the soil down. After this has been done, use a thin slat of wood, such as a piece of lath, to tamp the new soil until it attains the same degree of firmness as the soil in the old ball. Add more soil if necessary to bring the finished surface up to within ¾ of an inch of the pot rim. This space between the surface of the soil and the top of the pot facilitates watering. Beginners tend to completely fill the pot with soil. When this has been done the only effective way of properly watering the plant is to stand the pot for a few minutes in a vessel of water, a process that is not always as convenient as watering by means of a watering can.

When you have finished repotting your plants, water them thoroughly, but do not water them again until the earth begins to dry out. Much harm may be occasioned by over-watering newly potted plants. When the new soil has become filled with roots, greater liberality in the matter of watering may be practiced.

When a plant has to be repotted because the soil has become water-logged and the roots, as a consequence, unhealthy, the best method is to take the plant from the pot, shaking as much soil as possible from the roots and washing off the remainder either by swishing the roots up and down in a pail of water or by allowing water from the faucet to run over them. When the roots are clean, look them over carefully and cut off with a sharp knife any that are decayed. Set the plant in a pot just large enough to accommodate the roots without overcrowding them. The soil used for repotting these sickly plants should not be rich. Use garden soil and sand, half and half. Spread the roots as much as possible, place the soil between them, and make firm with the fingers. When healthy roots are formed, give supplemental feedings or repot in a larger pot using the rich soil mixture previously advised.

No definite rule can be laid down as to when plants should be repotted. If they are making vigorous growth the work may be done at almost any time, but, as a general rule, repotting is done to the best advantage just before the plants begin their new growth, usually in January or February.

Sometimes it is desirable to divide the plants instead of shifting them into larger pots. When this is done it is possible to make two or more plants from one. Such plants as aspidistra, African-violet, sansevieria, and many of the ferns lend themselves admirably well to this form of propagation. Preferably the dividing should be done immediately before new growth starts. Turn the plants out of their pots, shake most of the soil from their roots, and break them apart, using the fingers and a knife if necessary. The divisions should be potted up as previously described. When watering these newly divided plants avoid getting the soil into such a condition that it is constantly soggy.

Before repotting your plants, be sure that they really need this care. Much of the unhealthiness of house plants may be traced to an attempt to grow them in pots that are too large. Furthermore, remember that it is the plant that should be beautiful, not the pot. ◆

HOUSE PLANT PROBLEMS

Similar symptoms can sometimes be caused by completely opposite situations. Try this checklist to see if you can pinpoint the source of your problem.

Daphne S. Drury

SYMPTOMS	*CAUSES*
Leaves wilted	Too much or too little water. Too small or too large a pot.
Leaves dropping off	Too much water.
Bottom leaves are yellow	A few are natural. If there are many, the plant may be potbound or may be going into a resting period.
Leaves are pale green or yellowish	Too little or too much light. Lack of fertilizer, particularly nitrogen.
Plant thin and etiolated	Too little light.
Growth stunted	No drainage hole. Too heavy a soil mixture.
Leaves have dry tips	Humidity too low or soil too wet.
Leaves rolling up	Drafts, especially from an air-conditioner or ill-fitting windows.
Yellow or brown spots on leaves	Caused by sun burning the leaves.
Successive leaves growing smaller	Potbound or insufficient fertilizer.
Plant rotting at neck or crown	Too much water. Badly drained soil. Too cold.
Plant (poinsettia) doesn't bloom	Needs equal day and night length to set the flower buds.
All leaves drop off suddenly	Cold air. Gas injury. Lack of water.
Plant gets too tall for room	You're doing something right.

Episcia and African-violet *George Taloumis*

Guidelines and plants for difficult conditions

HOUSE PLANTS FOR NORTH WINDOWS

Mollie Harker Rodriguez

MANY city dwellers have only north windows or east and west windows in the shadows of giant buildings and so believe that trying to grow house plants is bound to end in failure. However, there are a number of popular house plants quite easily maintained under such dismal conditions.

The house plants usually selected are those which are naturally understory or ground-cover species from tropical forests. In spite of the greater intensity of light in those tropical regions, the light actually reaching the plants on the ground is minimal, due to the filtering effect of all the vegetation above. The conditions existing in the natural habitat are similar to conditions of full exposure to light in a north window here. This doesn't mean that just any plant will do well, however. One group to avoid is succulents. You must select suitable plants and care for them properly.

Here are a few guidelines:

1. Provide as much light as possible. Avoid hanging heavy draperies in the windows where you want to grow plants or at least have them tied back out of the window itself.

2. Plants will naturally stretch toward their source of light, especially if there is less than enough available. Put plants at the level of the windowsill or above. If they are placed below they will grow very tall and spindly.

3. Rotate pots regularly for again the stems will stretch toward the window if they are left in one position for any length of time. This only produces lopsided and unattractive plants.

4. Place pots as close to the window as possible, small ones in front and larger

Judy Sugar

Everyone knows the heart-leaf philodendron and nearly everyone can grow it successfully because of its rugged constitution.

ones behind, but don't allow the leaves to touch the glass for they will be browned by the effect of the cold during freezing weather. At night you might put layers of newspaper between the plants and the window to prevent this from occurring.

5. Be careful not to overwater plants under these conditions. During the winter months the plants are simply existing and not showing any growth at all. Therefore, the amount of water used is small and should be provided accordingly. The pots dry out mainly because of high temperatures and dry air. Feel the top of the soil to be sure it is dry before watering. It is better to use pots with drainage holes. Also, don't let pots stand continually in a water-filled saucer.

6. Maintain as high humidity as possible by either spraying the leaves daily with a mist of water (except African-violets and begonias) or by grouping the plants together on a tray with pebbles which can be kept partly filled with water. The pots should rest on the pebbles above the water level.

7. Select plants which are healthy and sturdy. Don't try to revive sickly looking specimens for this will take entirely too long and probably you will never get a healthy-looking plant again. The idea in growing house plants is to have an attractive display of greenery to make your rooms more inviting and to enhance the existing decor.

8. Fertilize with a general-purpose house-plant fertilizer only from April until September. Overfertilizing will not compensate for lack of light.

The most suitable plants for north windows:

Chinese-evergreen *Aglaonema modestum*

This deep-green-leaved plant from the Far East is known especially for its low light requirement and its ability to thrive on fireplace mantels and coffee tables where light is notoriously poor. It is often grown in water as well as in pots where it should receive moderate watering. It is extremely durable, slow growing, relatively small in size and needs very little attention.

Spider-plant *Chlorophytum capense*

This is an extremely dependable and decorative plant for hanging baskets or pot culture. From the base of a rosette of linear leaves, green and cream in color, sprout flower stalks which then form individual plantlets at the point of attachment of each flower. These can then be left on the plant or removed and potted separately to form new plants.

Earth Star *Cryptanthus bivittatus minor*

One of the bromeliads (see page 46). The earth star forms a low, flattened rosette, each leaf having two pale lime-green bands and salmon overcast. Most bromeliads are tree perchers, but this one is a terrestrial variety which nevertheless should not be over-watered.

Dumb-cane *Dieffenbachia* spp.

These tropical American foliage plants make excellent apartment specimens for they tolerate high heat, dry air, very little light and moderate watering. Many people begin their house plant adventures by growing these plants—which speaks well for their adaptability. Usually dumb-cane is recognized by its long, bare and rigid stem topped by a cluster of rather large, variegated leaves. It is natural for these tropical plants to lose their lower leaves as growth continues. If such a leggy-looking plant bothers you, it is possible to propagate the top. Or cut off the stem at the base and it will sprout again. If there are children in your house you should be cautioned about keeping this plant out of their reach, for if the leaves are chewed they will produce numbness in the mouth, as the common name implies.

(*Continued*)

Boston Fern *Nephrolepis exaltata 'Bostoniensis'*

Ferns comprise a large group of plants adapted to high humidity and low light conditions. Spraying the fronds with water is required. The Boston fern is one of the most reliable, but you should also try other varieties of this species.

Peperomia *Peperomia obtusifolia*

South America is the home of this very large genus of popular house plants. This species has bright green, leathery-to-succulent, upright spoon-shaped leaves. It makes an attractive addition to a dish garden or miscellaneous grouping of plants. Peperomia tolerates the conditions in our homes but must not be overwatered, especially in the winter. There are other species which you might like to try if you are successful with this one.

Heartleaf Philodendron *Philodendron oxycardium (cordatum)*

Philodendron, which means "tree loving," is a vine and an especially fast climber with aerial roots along the stems. This one has glossy deep green, heart-shaped leaves and can be used as a cascade or trained on a support of bark slab or milled treefern. It is a quick grower and can be cut back when it grows too high. The heartleaf philodendron is probably the most widely sold and most popular house plant on the market today. You will find that there are many other philodendrons suitable as house plants, also.

African-violet *Saintpaulia ionantha*

Another plant which everyone knows. It is perhaps the only plant that will give showy flowers in your north window. Several thousand named cultivars are now available. The colors of blossoms vary from white through the pinks to deep purple. There are also many double-flowering varieties. Choose the purple and white varieties first for they characteristically will bloom most easily. See page 20 for cultural information.

Snake-plant *Sansevieria trifasciata*

Almost everyone has noticed the snake-plant in shop or restaurant windows. It is characterized by a rosette of upright leathery, slightly mottled dark-green leaves. The variegated form, *laurentii*, is even more widely grown and there are other varieties worth trying, also. A native of arid regions of South Africa, this plant will adapt to almost any conditions, except overwatering in winter.

Pothos *Scindapsus aureus 'Marble Queen'*

This is another high climbing vine which clings or creeps by rootlets. It provides a handsome contrast in a group of plants because of its very striking cream-streaked leaves. Although this species is found in the monsoon region of Malaya, it thrives in the warmth of our houses and is extremely durable. Avoid overwatering in the winter.

Wandering Jew *Tradescantia fluminensis*
Spiderwort *Zebrina pendula*

Both of these belong to the same family and both are sturdy reliable trailing plants well adapted to trying household conditions and low light intensity. They are easy to propagate and require minimal care. Tradescantia has small dark-green leaves while the zebrina has striped leaves with a vividly purple underside. They will grow in water and are fine in hanging containers.

Eva Melady

A window garden of herbs (*from left to right*): rosemary, pineapple sage, parsley, basil, sweet marjoram, chives and thyme.

HERBS IN A KITCHEN WINDOW

Elsa Huntley

A GARDEN to suit your purpose, your limitations, and your taste—why not, in these days of crowded living conditions, a garden of herbs in a south window?

Start with a pot of chives. Set a cluster of the small onion-like bulbs in a pot and—presto—you have succulent green leaves for soups, salads and omelettes. More subtle than onion, chive is wonderful in cottage cheese. Always cut chives with scissors to retain the flavorful juices which would be lost if the tubular leaves were chopped.

Parsley is more than a garnish. It is a basic seasoning for marinades of fish and meat. New potatoes with parsley and melted butter are delicious. A plant potted from the garden in the fall will supply fresh sprigs of this vitamin-packed herb for mid-winter dishes.

A window herb garden would be sad without thyme. Seeds germinate readily. Sow in sifted loose soil as the seeds are very fine. The chopped fresh leaves are delicious in fish sauces, stews, poultry, game, chowders, fricassees and with cheese.

Sweet basil is one of the ever popular culinary herbs. The seed germinates readily in a well-drained soil. Pinch out the top several times to produce bushy growth. The sweet, spicy flavor is excellent in cheese or tomato dishes and good in a tossed salad, too. There is an old myth which says that stroking from a fair lady's hand preserves the life of basil and causes it to grow.

Sweet marjoram is beautiful to see and heavenly to smell, as well as flavorful. Mix the fine seeds with sand when sowing. Germination is slow and the seedlings require patient and tender handling until the true leaves appear. This herb adds much flavor to poultry stuffing and lamb, is delicious with mushrooms and is particularly good in a butter sauce for fish, with savory and parsley.

Some cooks prefer oregano to sweet marjoram. Both react similarly as window garden subjects. Oregano with chopped sweet basil and a clove of garlic adds richness to a pizza and is a fine seasoning for meats.

Rosemary is a must in a window herb garden for it is perhaps the most enchanting of all herbs. Plants should be started from cuttings rooted in sand or water and if a generous amount of lime is added to the potting soil, this pungent, spicy plant will grow strong and handsome. Rub the breast of a roasting chicken or duck with rosemary, or try some in the stuffing.

Some cooks consider summer savory an indispensable ingredient of many dishes, but as this plant does not bear cutting back, it is advisable to grow winter savory, which has a similar flavor, in a window garden.

Culture

If you have the space you might wish to include a few other potted plants, such as those which today are sought more for their delicious aroma than culinary uses. In this category would be any of the scented-leaved geraniums and the very fragrant pineapple sage.

A good soil mixture for potted herbs consists of three parts loam to one part compost or well-rotted manure. The soil should be light and well drained. Be generous with the pot size and water regularly. If necessary, spray every three to four weeks with a nicotine insecticide which contains a soap spreader. Wash the plant thoroughly with the solution and let stand a few hours, then spray thoroughly with clear water to remove spray residue.

Use your herbs with imagination, and put them in some of the interesting handmade clay pots if you can obtain them. You may have as much fun as you would in a conventional herb garden with brick walks, knots, and allées. ♦

Marjorie J. Dietz

The leaves of the peppermint-scented geranium have a velvet-like texture and are exceptionally aromatic. Grow it with other herbs in a cool, sunny window.

The moisture requirements of house plants are often a puzzle to indoor gardeners

TO WATER OR NOT TO WATER...?

Lois Beckett Himes

NOAH'S FLOOD of biblical times covered all vegetation and every living thing. But a three-year drought was bestowed upon Ahab by Elijah. Water has been the bane of farmers. They either have too much or too little and seemingly are never satisfied: when it does finally come, it invariably comes at the wrong time, preventing the combines from getting into the fields and forcing the hapless farmer to wait for dry weather. Next to the correct amount of sun, water is the most crucial ingredient for growing plants. Indoor gardeners tending house plants are lucky: they can control the water supply.

The indoor gardener has only to decide how much water his plant requires and then give it that amount. Easy! Some of the determining factors of how much water to give a plant are: its climatic origin; its favored soil; the type of pot the plant occupies; room temperature, humidity, and whether it is in the shade or direct sunlight.

Plants from desert regions, such as cacti, need little water. But the dracena is native to the tropics and grows best in moist conditions. The climatic conditions of the native locale also supply tips as to the best method of watering. Desert rains usually come in torrents and desert plants can receive copious quantities of water at any given, but infrequent time. Conversely, the dracena would flourish with a gentle mist over its leaves all day to approximate the light rainfall in the jungle.

The type of soil and pot in which the plant is growing has a direct bearing on the amount of water required. Sandy soil will not retain moisture as well as heavy soil or peat moss. Clay pots are more porous than those of plastic and consequently need more watering.

A plant living in a warm or dry atmosphere normally requires more water than a similar plant in a cool humid atmosphere. Plants in a heated room require watering more often than when grown in an unheated room. Plants growing in direct sunlight transpire more rapidly than those in the shade and require more water. As transpiration is more rapid during daylight hours, it is advisable to water early in the day as this is when the need for water is greatest. Do not water on days when the skies are overcast or it is raining—unless, of course, the soil is bone-dry. There will be sufficient humidity in the air on those days to compensate for the moisture the plant is losing through its leaves. Plants will need less water during the winter months also, because their whole rate of growth will be slowed down due to decreased light intensity.

Weighing the Pot

The experienced grower can tell by the weight of the pot whether or not the plant is in need of water. However, the beginner will find the best way by touching the soil. If the soil feels really dry, this is an indication that the plant needs water.

The amount of water given at any particular time is very important. If the plant has been potted correctly there will be a space between the top of the pot and the surface of the soil (see page 7). The depth of this space should be approximately one-tenth of the pot. This leaves a reservoir for water, and allows a sufficient amount to drain all the way through the soil and out the drainage holes, thus wetting the soil throughout the container and not only just at the top.

Pots having a saucer beneath to catch

One way to simplify the problem of watering indoor plants is to grow them in water, as is being done with these hyacinth and paper-white narcissus bulbs.

George Taloumis

the excess water should be emptied after each watering. If the plants are allowed to sit constantly with their roots in water they will not be getting the oxygen which is so important for good growth. However, if the saucer is filled with pebbles it will act as a sump for the excess water, which can be left to evaporate, thus increasing the humidity around the plant.

Adequate drainage should be provided, because roots need oxygen as well as water if they are to function properly. If the plant is kept in a water-logged condition by constantly overwatering, the plant cannot thrive.

There is a controversy as to whether it is best to water potted plants from above or below. The primary advantage of watering from above is that it is quicker. It seems to take an interminably long time before the water—absorbed from the bottom of the pot—dampens the soil on the surface. However, when watering from the top, it is necessary to avoid pouring the stream directly into the center of the plant. Doing so causes two problems: First, the soil can be washed from the roots, leaving them exposed, and second, there is the risk of encouraging botrytis (gray mold) to set in and eventually kill the plant. When watering newly potted material, it is good practice to use a spray head on the watering can. This also helps prevent the first problem—exposure of the roots. In the case of seedlings, it is best to water from the bottom by immersing the pot up to its rim in a larger container of water, as the seedlings do not benefit by being wet.

A common error is to water any plant which is wilting, regardless of whether it is wet or dry. In this case, the cure may be the killer. Plants suffering from overwatering show the same symptoms as plants which are too dry. If a plant is showing the effects of overwatering, the remedial process is simple: do not give it any water until it has dried out. The drying-out process can be speeded by placing the pot in a warmer location to encourage transpiration and by gently cultivating the surface soil to permit more aeration. It is a good idea to move the plant into direct sunlight and resume watering in the recommended manner as soon as the plant shows signs of recovery.

If all else fails, the surest rule to follow when deciding whether to water is to refrain when in doubt. In this case it is better to put off until tomorrow. The second rule is always to provide the plant with an adequate watering and not just a taste. ◆

The Horticulturist at the Brooklyn Botanic Garden answers some often asked questions

QUESTIONS & ANSWERS ON HOUSE PLANTS

Edmond Moulin

My African-violets appear to be deformed and stunted, but I do not see any pests on them.

Your plants are most likely infested with the cyclamen mite if the young leaves are curved upwards with white webbing on them. This mite, which is visible only under magnification, is difficult to control.

Use the miticide Kelthane 18.5% E.C., diluted at the rate of ¼ teaspoon to a quart of warm water. This solution can either be sprayed on the plant or, better yet, used as a dip in which to submerge the foliage. The dip method assures thorough coverage of the foliage. Repeat the miticide treatment three times at 7- to 10-day intervals.

Sometimes it is wiser to destroy any African-violet plants which are severely infested with cyclamen mites rather than risk spreading the pesty mites to other plants.

Procedure for dipping foliage of a potted plant without loss of soil: cut a piece of aluminum or plastic wrap, larger in diameter than the width of the pot with a slit cut mid-way. Slip the cover around base of stem, then enfold around pot. When the pot and cover are held, the plant can be turned upside-down without loss of soil.

I hear conflicting reports as to whether air conditioning is harmful or beneficial to house plants. In my office building the air-conditioners are turned off on weekends. Can plants adjust to this on-again and off-again treatment? What about air-conditioners in houses?

Air conditioning need not be harmful to house plants and can be beneficial—if we remember to place plants away from drafts of air and also consider a little about plant physiology.

House plants grow better if the temperature during the daylight hours is 10° to 15° F. higher than during the night. Hence, in an office building where the air conditioning is in operation during the

Photographs by George Taloumis

Before house plants which have spent the summer outdoors are brought inside for the winter months, their pots should be washed to remove accumulations of unsightly soil and moss.

A collection of scented-leaved geraniums—apple, fern-leaf, 'Prince Rupert' and strawberry.

daylight hours and off at night, the plants may barely survive.

Air conditioning in the house is usually run day and night, and often is in operation more at night when the family is home than during the daytime. Usually this does not present a problem. Plants are quite adaptable to the changes in temperature which occur in the home. If the plants are in a sunny window or under lights, leaves are warmed by the light rays and can be much warmer than the surrounding air temperature.

When should house plants which have been kept outside during the summer be brought indoors again? My neighbor says they should be placed inside before the heat is turned on, but I would think they should be left outside as late as possible.

Maybe you would want to leave an azalea outside "as late as possible" in order to provide a brief cold period to induce mass flowering rather than scattered flowering. However, this is not a good practice to follow for most house plants.

Plants should be brought indoors before the heat is turned on and most assuredly before the night temperature falls to 45° F. The lower light intensity and lower relative humidity found in the home compared to outside are environmental changes to which the plant is subjected. When the heat is turned on, not only is the air warmer, but also it is relatively dry. Also, when a plant has been "hardened off" with cool night temperatures out-of-doors and then must quickly adjust itself to a hot, dry-house climate, there is a difficult transition period.

This summer I started collecting scented geraniums. Now I must bring them inside for the winter. What conditions indoors will suit them best?

Generally speaking, geraniums do not do well in hot, dry rooms. They should be kept in a sunny window (preferably with an unobstructed southern exposure) during the winter months and should have a night temperature of 62° to 65° F. (10° to 15° warmer during the day). If you lack a sunny window, grow the plants under fluorescent lights.

I have a very large healthy geranium. Can I train this into a "tree" form?

A healthy geranium can be trained to "tree" form by removing the lower side shoots from the main stem. (These side shoots can then be used to propagate new plants.) The plant is maintained to a single stem until the proper height has been attained; then the lateral branches are allowed to grow near the top of the plant in order to develop a canopy of foliage. The tips of the growing shoots can be removed to promote a denser crown. The main stem should be secured to a plant support to insure against breakage.

Are the fruits on a potted citrus edible? If they are, how do I know when they are ripe?

The fruits of a potted citrus are edible, but many are so tart that they are best used to "liven-up" a drink and to make marmalade, or the fruit rind can be candied.

Citrus fruits are ripe when they have acquired color and the fruit is easily plucked from the "stem." The longer the fruit remains on the plant, the better the flavor components will be.

This summer a friend gave me a potted juniper trained as a bonsai. What do I do with the plant in the winter? Can it survive for several months in an apartment?

Most of the species and varieties of junipers do best if given a cold winter treatment in a deep coldframe or on a sunny freeze-free porch maintained with a night temperature below 45° F. (whenever possible).

I have grown *Juniperus procumbens* 'Nana' in an apartment for three years, and it has done well: but it is not a practice which I would recommend. Rarely does a "home-grown" juniper compare to one grown outside; the decline of the house plant juniper is to be expected.

What rule of green thumb concerning potting soils would you give a new grower of house plants?

Use garden soil if available, with peat moss and coarse builder's sand added. Soils vary, and if a heavy clay is used, a satisfactory mixture would be 1/3 soil, 1/3 sand and 1/3 peat moss. Lighter soils need a smaller proportion of peat moss and sand. If the garden soil is naturally sandy, perhaps no additional sand will be needed. The texture of the mix is the important point, not the color of the soil. Your "feel" for a good mix develops in time.

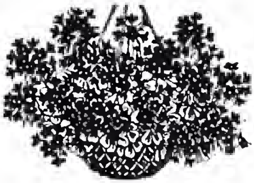
Note: Don't add just sand to a heavy soil, for when the mixture dries out, the plant will be resting in concrete. Of course, most cacti and other succulents require a higher proportion of sand, up to three-quarters or so, and little if any peat moss. However, they thrive when some dehydrated cow manure is added to the soil. Also, see the important remarks on soil pasteurization on page 60.

Is there any special advice you would give apartment dwellers about potting soils?

When garden soil and sand are hard to obtain, buy pasteurized commercial potting mixes from a garden supply store. Caution: some commercial mixes aren't mixes at all, but just ordinary Michigan peat, an attractive black humus that really requires the addition of sand and soil. If you can't obtain sand, substitute Perlite or similar inorganic material. I don't recommend Vermiculite, for I have found that it loses its porosity in time.

How often should I fertilize house plants?

For most plants it is sufficient to use a water-soluble fertilizer every three weeks from March to late October, their active growing season. Two or three applications, according to manufacturer's directions, are best for the remainder of the year, when the plants make naturally slower growth due to less light. Overfertilizing in winter often results in a leggy plant with little "body." I prefer a water-soluble fertilizer to a granular one because there is less danger of burning the roots, providing the soil is moist before the application. Fish emulsion is another very satisfactory fertilizer. ◆



THREE EVER-POPULAR HOUSE PLANTS

1. AFRICAN-VIOLET

Frances Miner

AFRICAN-VIOLETS appeared in the florists' trade during the 1930's and in a remarkably short time achieved widespread popularity. Their ever-blooming habit and the fact that they will thrive under average home conditions make them an ideal gift plant. New owners will want to understand a few basic requirements and then be prepared to give them regular and consistent care. (Most gardeners today know that the African-violet is a tropical plant, *Saintpaulia ionantha,* and no relation to the outdoor violet, *Viola.*)

First, moderate to very good light but not hot sun, is of prime importance. East or west windows are best and they should be equipped with a thin curtain to reduce direct sunlight on bright days. North windows are sometimes satisfactory if a nearby white wall reflects light, or if the window faces a wide expanse of open sky. Turn the plants frequently to keep the growth symmetrical.

Indoor gardeners who have been experimenting with fluorescent light find African-violets grow unusually well under artificial light and often produce more flowers than window-grown plants. Combinations of cool white, daylight, wide-spectrum and Gro-lux tubes have been used successfully. The lights are placed from 6 to 10 inches above the plants and are turned on from 12 to 16 hours a day. Some growers find that dark-colored flowers grow better near the center of the tubes, leaving the end spaces for the whites and lighter colors.

Second point: "How much" and "how often" to water really depend on temper-

Judy Sugar

Both flowers and foliage contribute to the special beauty of the African-violet. This variety is called 'Coral Glow'.

The hairy and often quite puckered surfaces of African-violet leaves will collect dust. A soft-bristled paint brush can be used to remove it.

George Taloumis

ature and humidity in the room, the kind of pot and the soil mixture (see page 15). African-violets have fine, hair-like roots that need constant moisture. The proper potting soil for them should be loose and porous with plenty of organic material to accommodate the fine roots. Such a mixture drains quickly and allows air to reach the roots. Wick-watering is a convenient device to prevent the soil from drying out, but watering can be done satisfactorily by hand, either applied to the top of the pot or to a saucer of water in which the pot stands. In the latter instance, do not leave the pot indefinitely in a saucer filled with water or the plant will drown! Water at room temperature is good for the plant, and any that drops on a leaf is less likely to make unsightly brown spots. Daily watering may not be needed, but daily inspection is necessary.

Three: A regular program of fertilizing is a "must" if African-violets are to bloom all the year. A complete water-soluble fertilizer recommended for these plants should be mixed and used according to directions on the package. Many growers prefer to use dilute solutions more frequently. Never use fertilizer on dry soil, but if watering has been carried on properly, this will not be a problem.

Four: Temperature and relative humidity, of course, are related and are important matters for new owners of African-violets to consider. Despite the African-violets' reputation for growing in the high temperatures of modern rooms, they will not continue to flower in hot dry air. Under such unfavorable conditions, buds may fall off and blossoms will fade too soon. (Wind, drafts or sudden drops in temperature below 60°F are equally unsatisfactory.) A uniform temperature of 70° to 75°F and humidity between 40 and 50 percent are ideal. A window tray where pebbles or peat moss can be kept moist is one device for improving humidity around the plants. African-violets will thrive in large covered glass or plastic containers under fluorescent lights. Some ventilation will be necessary.

A last important point: Do not expect the plant as you receive it to go on forever. African-violets should be repotted and moved to a pot usually one inch larger every year or so, preferably in the spring. One very successful grower discards plants after two years and continually rejuvenates his collection by starting new plants from single leaves.

For details of propagation see pages 60-64 in the Handbook on House Plants. ◆

(*Continued*)

2. THE AVOCADO

Nancy Shopis

HOW many people have attempted to transform a left-over avocado pit into a magnificent tropical tree? How many of these same people have struggled with such seemingly life-and-death questions as—Which end is up? Do you start the pit in soil or water? Should you scrub it first?—And, of course, the ultimate question—Why isn't it growing?

The avocado is a pear-shaped fruit as its other common name alligator-pear suggests. Its skin is dark green, the flesh soft and the large pit oval-shaped. Supermarket kinds come in two sizes—large and small—the latter, from Florida, the former, from California. It is the Florida fruit that is most apt to grow for the indoor gardener.

Start the avocado by taking the pit (seed) and washing it in warm water, removing any left-over skin at the same time. Then, look for a prominent wrinkle at the broad end of the pit. This is its bottom and the location of future roots. Insert four toothpicks halfway up the pit at regular intervals to serve as a support. Then suspend the pit in a glass filled with warm water so one-third of the pit is covered with water. Keep the glass in indirect sunlight to encourage strong root growth. Keep the water level constant.

The vital life signs to watch for are roots and the appearance of a stem at the pointed top. These growth activities may occur in a few weeks or in a few months. It is suggested that you start a new pit if your first is still a failure after three months, but of course, you can start pits as often as you serve avocado salad!

Once the roots have begun their downward growth, you can expect the stem to appear. Once the stem has grown approximately 6 inches, its top should be pinched back to encourage continuous root growth. Do not pinch off more than half the stem—and do not fret, for new foliage growth will start again in about two weeks' time.

The pit will have to be transferred to a growing medium when a good root system has formed. The soil can consist of equal parts of sand, soil and peat moss. Select a pot with holes in the bottom to insure adequate drainage. Be sure and choose a pot size in proportion to the size of the pit and its roots. Place three-quarters of the pit in the soil. Take care not to damage the roots. And don't forget to remove the toothpicks! Water the soil well and keep the plant in indirect light for a few days. Then place in a sunny window.

Now that your avocado is well on its way to great heights, it might be well to present a few of the cultural tips needed to keep it in its healthy state.

Watering is very important. The avocado will need a drink whenever the top of the soil is dry. Watch for water to run out of the bottom of the pot. This should indicate that the entire soil area has been moistened. Be sure and spray the leaves with water, too. After all, the avocado is a tropical tree and it will need all the humidity it can get in hot, dry apartments.

Fertilize the plant every three weeks. Choose a plant food that is high in nitrogen to keep those leaves a lush green color.

Pinching is a necessary procedure. Most people prefer a bushy avocado to a straight-as-an-arrow one. Remove about an inch of the soft top growth. This will cause the lateral growth that you're looking for. Pinch as often as you deem necessary. Do expect some of the lower leaves to drop off. After all, the avocado is a tree in the tropics and it will be one for you, also.

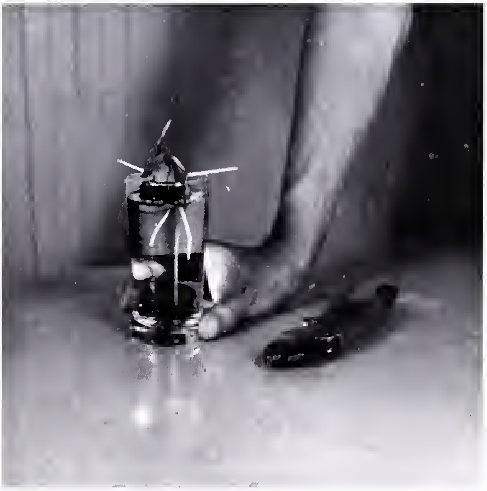
Don't expect it to flower and fruit. The indoor plants grown in the colder zones do not receive the light intensities they need to produce fruits. Be satisfied with its handsome tropical foliage. ◆

Marjorie J. Dietz

Above: Two avocado plants flank a gardenia on the windowsill of a city apartment.

Right: This avocado seed, suspended in a glass of water, has formed roots and sprout.

George Taloumis



(*Continued*)

3. THE GARDENIA

Loretta Wohlt Hodyss

GARDENIA or Cape-jasmine (*Gardenia jasminoides* var. *veitchii*), which is admired for its glossy leaves and fragrant white flowers, came to the United States from Southern China by way of South Africa. In its native China the gardenia grows in a cool, moist climate on hillsides where drainage is never a problem.

Here the plants are anxiously carried home from supermarket, florist shop or dime store to be placed in the warm, dry air of modern dwellings. Considering the great difference in those two habitats, is it any wonder that many persons are disappointed in the gardenia's performance as a house plant?

Gardenias are certainly not one of the first house plants for the beginning gardener to try. Even experienced gardeners have difficulty agreeing on what cultural methods are best; but a few requirements are generally accepted as being necessary for success.

Uniform soil moisture is especially important: the soil should never be allowed to dry out. Therefore it becomes necessary to provide very good drainage so root damage can be avoided.

As with many other house plants, maintaining the necessary high humidity is often a problem; yet, the solutions are actually relatively simple. Pots can be placed on a tray of dampened pebbles; the moisture from it will supply the air with added water vapor; or the foliage can be sprayed or syringed frequently with water.

If you find that the foliage of your gardenia is turning yellow you may not be giving it enough light. In its natural habitat, it grows as part of the understory in a forest. Thus it prefers mottled sun. Since this is hard to provide in the home, give the plant good light but not direct sunlight; a south window usually provides the proper exposure.

The plant which is getting the proper amount of light and still has yellowish leaves may need a new fertilizer program. At two- or three-week intervals from mid-winter to early autumn, feed with a balanced house plant fertilizer. Maintain an acid soil of pH 5.0 to 5.5 for the best growth.

Perhaps the most difficult part of growing a gardenia is to provide the proper temperature. In order to initiate flower buds, the night temperature should be 60°-65°F and the day temperature 70° to 75°F.

A summer spent outside under the shade of a tree is also a great help. Repot the plant and sink it in a peat-moss mulch to keep the soil at even moisture. Pinching out the growing tips will produce a more symmetrical plant. Flower buds will not be produced on old wood so keeping the plant actively growing increases the likelihood of bloom.

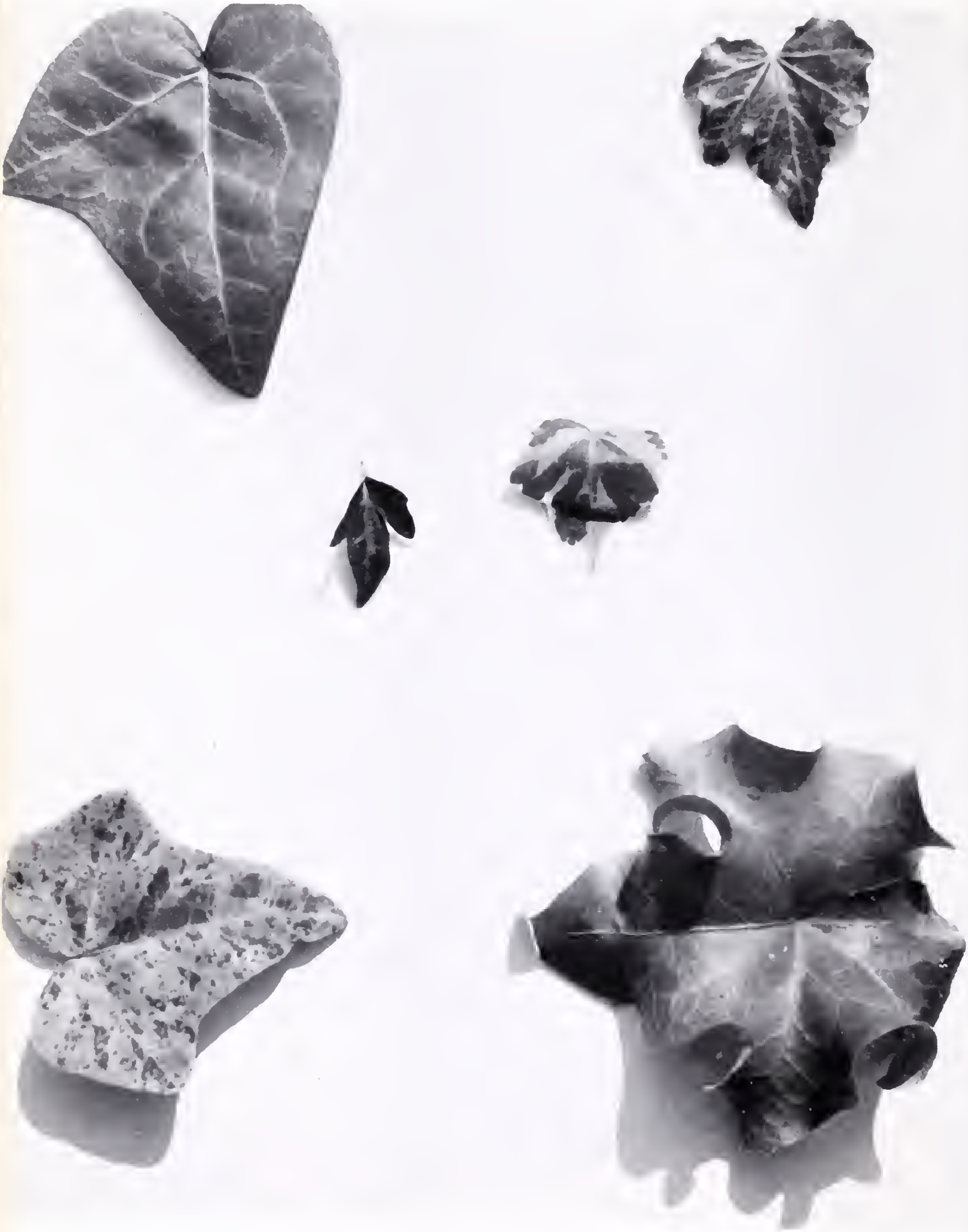
Most of the problems which arise with gardenias are cultural, but aphids, mealybugs, and white flies are also a problem at times. Malathion or nicotine sulfate can be used to eliminate them.

If you find that you are really doing well with your gardenia and you would like to have several more, try propagating them from the tip cuttings of the original plant. Remove the leaves from each cutting except for two or three at the tips, dip the ends in rooting hormone, Hormodin No. 2, (be sure that the excess is shaken off), and insert in coarse sand. Keep the sand moist and the humidity high. It requires about four to six weeks until sufficient growth is made to plant them in 3-inch pots.

Although for many the gardenia is quite difficult to grow, others have no trouble. Some only have problems in inducing flowering. Fortunately the shiny leaves are very ornamental in themselves. And, after all, what would gardening be without a challenge? ◆

George Taloumis

The gardenia, in its native habitat in southern China, grows in a cool and moist climate, not the easiest condition to duplicate in most modern dwellings.



Arthur Norman Orans

Leaf patterns of English ivy varieties: *Top left:* 'Sylvanian'; *top right:* 'Ivalace'; *center:* 'Meagheri' and 'Jubilee'; *lower left:* 'Golddust'; *lower right:* 'Manda's Crested'.

A well-grown specimen is a delight to the eye and looks well anywhere in a room

ENGLISH IVY

Thomas R. Hofmann

IVY—the very word conjures up confusion for new growers of house plants. For there are plants called grape-ivy, German-ivy, Swedish-ivy and several others belonging to various plant genera, but my own favorite is English ivy, known botanically as *Hedera helix*.

It is a common plant, indoors and out, and usually so easy to grow that only house plant enthusiasts who seek a real challenge shy away from it. As a propagator, I enjoy that challenge too, but at the same time I always find English ivy fascinating because of its beauty, dependability, and variation in foliage from plant to plant.

If you are new to indoor gardening, you might well choose English ivy as a starter. And if you are a collector, there is the pleasure of tracking down and growing the finest of the different cultivars, which are legion. In fact, English ivy is one of the most variable of all species of plants known to the gardener.

Growth Habits

Most English ivy cultivars may be divided into two types, depending on their growth habits. The first, in which new shoots grow freely from the nodes along the stem, is called self-branching. In some the nodes are set very close together and the plants are compact, dwarf shrubs. In others, the nodes are farther apart and the plants have loose, open branching. Such semi-spreaders require occasional pinching to look their best. Self-branching types make fine specimen plants and older ones are sometimes effective as compact cascades.

The second type, the vine, is of course well known to those who associate English ivy with the outdoor garden, but many ivies grown indoors also have this growth habit. The vine type doesn't branch freely at the nodes. In a pot it is a trailer unless given support, in which case it will climb or can be trained to climb by ties. This type makes a good cascade. Naturally, if you want to tie up and train English ivy in various shapes on wire or other support—a popular pastime for flower show exhibitors—the vining type is most desirable.

Named Varieties

Of the sixty-or-so English ivy cultivars grown at the Brooklyn Botanic Garden in the last decade, a half-dozen are particularly choice, in my view, and are good candidates for the indoor garden.

'Golddust' is a trailer with light green leaves speckled dull yellow, especially on the new growth. Leaves are about 2½ inches long and as wide. A robust grower which needs frequent pinching, it makes an attractive basket plant even in a sunny window, where other variegated-leaf forms are apt to burn in summer.

'Ivalace,' a dense, self-branching type. In time this dwarf shrub will spread but it is never a rampant grower. The leathery, dark-green leaves, curled upwards, are about ¾ inch wide and as long. A handsome plant which lends itself well to form training.

'Jubilee,' the tiniest of the variegated types, with brightly colored leaves ¾ inch wide and an inch long. Some leaves are completely white. A neat, slow-growing, prostrate spreader, though very self-branching. I know of one particularly attractive plant that has been grown as a bonsai in a coconut shell for five years.

'Manda's Crested,' a trailer, with large, curly, jade-green leaves. Makes a charming basket or pot plant. A robust grower, it is sometimes planted outdoors as a

Arthur Norman Orans

English ivy 'Jubilee' has variegated foliage. It is a small-leaved, compact and self-branching type.

ground cover in the New York area.

'Meagheri,' also known as the green feather ivy. A very tight, slow-growing, self-branching type, ultimately spreading. The refined dark green leaves of this dwarf shrub are but ¼ inch wide, 1 inch long. A distinguished selection for miniature containers or small pots.

'Sylvanian,' a somewhat self-branching type of moderate growth. The forest-green leaves, which vary in width, length and shape, average 1½ inches, and are so dense that they hide the branches. An elegant cascade or basket plant.

Care

SOIL: Average potting mixture, with a generous amount of leafmold or other organic matter.

EXPOSURE: Tolerant of a wide range of light conditions, but best growth will occur if you avoid a location with very poor light. Full sun is satisfactory in winter, but don't grow English ivy by a sunny window in summer unless there is a curtain.

WATERING: Let the soil become somewhat dry between waterings, which should be thorough. Frequent syringing of the foliage is helpful, especially in city apartments where the air is dry and soot is present. The warmer the room, or the greater the exposure to the sun, the more you will have to water.

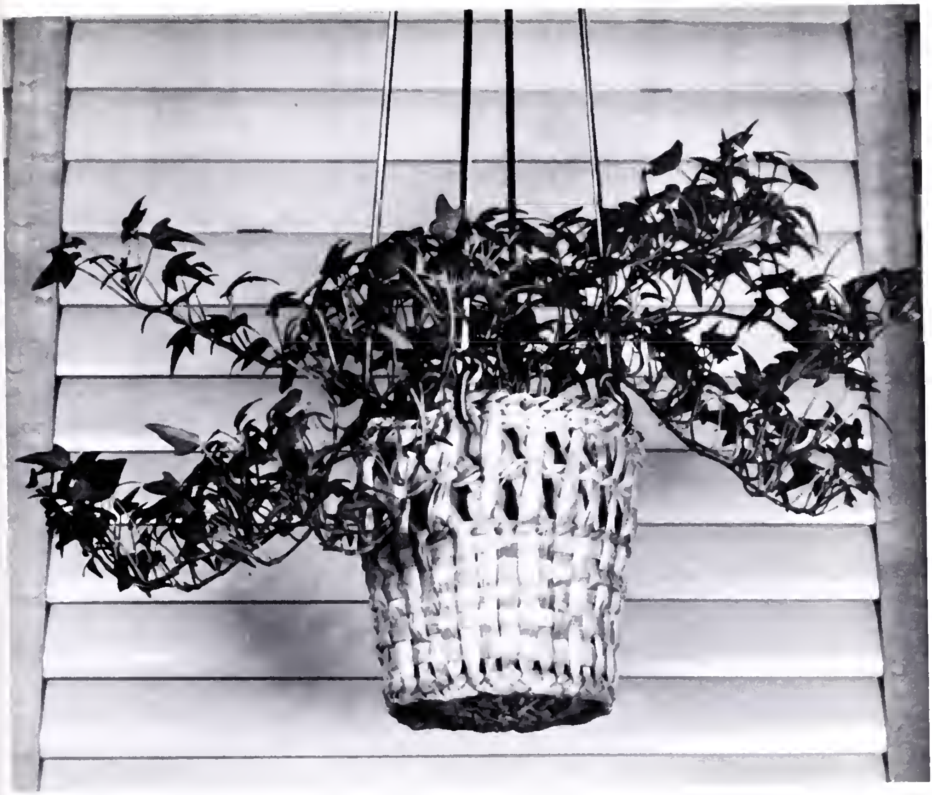
FERTILIZING: For best results, feed once a month with one of the common water-soluble fertilizers available from all garden-supply stores. In winter, when growth is slow, fertilize but once every two months.

INSECTS: Mealy bugs seem to be the main pest. Give the plants an occasional Saturday bath, washing the foliage thoroughly with water and a little soap. Mites, which attack shoot tips and stunt growth, are often a problem, particularly if English ivy has been allowed to become too dry. Certain systemic insecticides control them, as does the Saturday bath, but if there is a bad infestation, it is best to discard the plant.

Propagation

English ivy, at least in its common cultivars, is one of the easiest of all plants to propagate in the home. Simply put cuttings in a glass of water and, within two to four weeks, most of them will have rooted and can then be transplanted into soil. Fastest rooting takes place in the spring months, the slowest in winter.

A better root system—and less transplanting shock—will occur if the cuttings are propagated in coarse builder's sand, a peat/vermiculite mixture, or even just soil. Key point: don't let the rooting soil or mix dry out completely at any time. ◆



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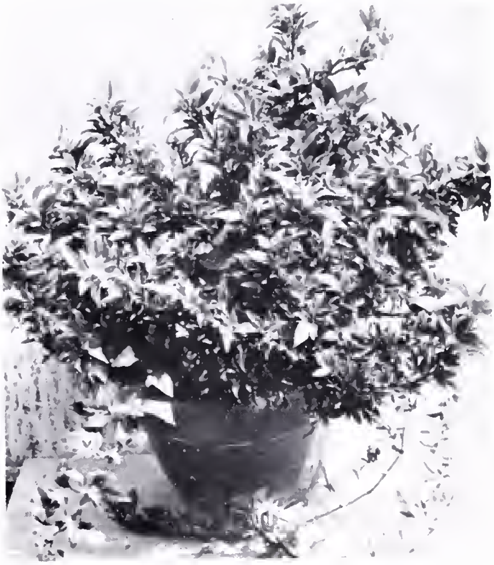
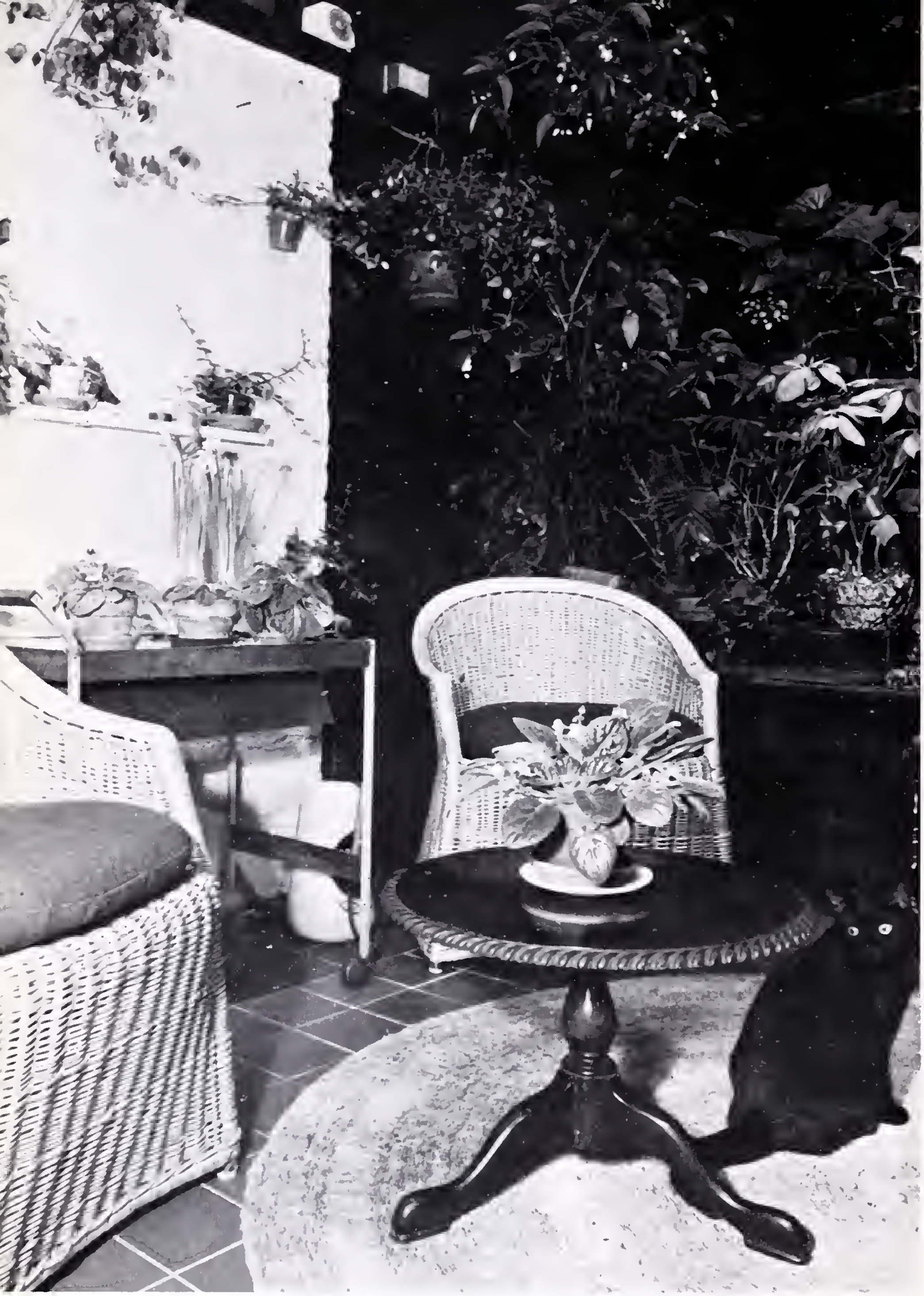


Above: English ivy is a favorite subject for hanging containers. This variety is 'Pedata'. *Right:* An exceptionally dwarf variety is 'Meagheri'. Its dark green leaves are ½ inch wide, 1 inch long.



Leslie Wheel—Photograph by Arthur Norman Orans

This combination garden room-greenhouse, which is dependent on artificial rather than natural light, has been planned for maximum enjoyment of a diversified collection of house plants.

HOUSE PLANTS AS DECORATION

Barry Ferguson

EVEN if you do not share the nostalgia for vintage cars and silent movies so popular today, as a plant lover you might well have wondered about the fascinating indoor gardens of the Victorian parlor. From faded photographs and the variety of plant stands that can still be found, the evidence exists that the house plant was more than a passing fad: it was an important feature of the period, part of the way of life. While some of these favorite plants of 100 years ago seem to have vanished, the stands and containers of that time are ideal for the display of plants in contemporary rooms.

While the potted palm is still with us, and the indestructible aspidistra is enjoying a revival, there is today a vast world of plants undreamed of by the Victorian gardener. Whether you start with seeds and cuttings, or choose choice nursery-grown specimens depends upon your taste and resources. Are your plants serving as furnishing accents or are they the expanding collection of the "plant-nut" who can never say no? If you are "good" with plants you do tend to attract them: friends give cuttings, plant societies often offer take-home samples. Soon every window ledge houses its share of the collection.

Here the problems begin to outweigh the pleasures, particularly if you plan a vacation, and have to find help with the watering schedule. Perhaps the Victorians can give the collector a few ideas: Group your plants, for example, to make watering, feeding and spraying easier on a tiered, wire-plant stand or étagère placed near a window. Extend this growing area by hanging ferns, episcia and grape-ivy from hooks in the ceiling or brackets from the windowframe. A collection of such trailing plants, whether in string nets or baskets, antique jardinieres or modern pottery makes a great alternative to draperies for a problem window. Light filtering through this curtain of green can be most attractive, particularly in a city apartment. An antique pedestal, perhaps claimed from a local garage sale, could be just the object to show off a favorite plant that is too big for the sill, yet too small for the floor.

George Taloumis

This plant stand shows the beauty and habit of each African-violet variety.

The vast, fascinating array of foliage and flowering plants available now offers decorative opportunities for both traditional and modern interiors. Beyond those I have mentioned, others, such as pick-a-back (*Tolmiea menziesii*), Rex begonia, asparagus-fern, purple-passion (*Gynura aurantiaca*), the palm family and the various kinds of tradescantia are suitable for period furnishings and grouping in the manner of the conservatory of the last century. However, the architectural form and distinction of certain other plants, make them, to my eye, thoroughly modern. They seem to relate perfectly—almost as sculpture—to today's uncluttered interiors. A large specimen cactus, *Cereus peruvianus*, for example, or the striking

George Taloumis

The owners of this contemporary plant room have kept it open and uncluttered to emphasize the individual form and grace of each plant.

George Taloumis

This fern, one of the very frilly, lacy varieties of the ever-popular Boston fern, is evocative of the Victorian era and its furnishings.

The more familiar forms of the Boston fern are decorative assets, whether displayed in clay pots or slipped temporarily into treasured jardinieres.

rosette of a perfectly formed agave, or a well-developed pony-tail palm (*Nolina,* formerly *Beaucarnea, recurvata*) are at their best in light, open living spaces, set perhaps in sleek stainless steel, fiberglas or the unashamed good lines of the classic terracotta pot. *Dracaena draco,* sometimes called dragon-tree, has been much used in modern commercial interiors. It is in high favor as a house plant because of its unusually dramatic forms and hardy disposition. Use it to offset the severe lines of a sparsely furnished room or to contribute a little drama to an entrance hall. Its effect can be increased by throwing shadow patterns on wall and ceiling with a floor-level spotlight.

The setting and display of plants offer unlimited scope and pleasure, and can change with the needs of the room, your whim or the seasons. Picture an orchestration of reds, bronze and lime-green coleus in a copper planter for a sunny window ledge. There is an antique beauty in the foliage of Rex begonia, which could be made more dramatic by combination with the gray foliage trails of 'Glacier' ivy, and some spikes of rose-pink hyacinths.

All three plants can be arranged in that favorite planter, basket, or whatever you have that is appropriate. Using house plants creatively becomes a most satisfying form of self-expression. If you are

The stark, dramatic silhouette of this dracena *(Dracaena marginata)* shows to best effect in a room of contemporary design with equally modern furnishings.

(Continued)

Display plants with flair and imagination. The succulent at left is dramatic because of the container in which it is growing. The prayer plant and statue *(below)* complement each other.

Photographs by Judy Sugar

George Taloumis

Holiday plants and other flowering plants introduced for temporary display can be moved about freely and used wherever they supply needed decorative effects. The ornamental value of these Easter lilies is enhanced by the lower-growing, always graceful spider-plant (*Chlorophytum*).

sufficiently daring and imaginative, house plants can also help you solve decorating problems—and they are cheaper than furniture if you are just starting to decorate rooms. To break up the long-narrow look of a room, use strong, upright forms, bamboo palm (*Chamaedorea erumpens*), *Dracaena massangeana* and *Fatsia japonica,* for example, in a floor planter to define areas for different activities. In summer, fill the empty fireplace with *Aglaonema commutatum* or *A. roebelinii* (Chinese-evergreen), or a basket of Boston fern.

House Plants Under Lights

The improvements in the field of indoor plant lighting are boons to the gardener running out of space. The basement can become a propagating nursery. Areas under stairs, in bookshelves, and in bathroom cabinets can suddenly become green. Orchids and gesneriads thrive in the humidity created by terrariums and other chambers and will bloom well under lights. Other previously inhospitable corners, stairwells and entrance halls can now support their own piece of the jungle with the addition of lights. ◆

Arthur Norman Orans

George Taloumis

(Above): A modern window in a penthouse apartment provides abundant light for various kinds of house plants.

(Left): Zebrina shows its form best in a hanging container, indoors or outside against a terrace wall. As with its close relative, tradescantia, zebrina is one of the house plants which associates well with Victorian and other traditional interiors.

Marjorie J. Dietz

George Taloumis

Above: An amaryllis and wax begonias are the major flowering plants in this informal window garden in late winter. *Left*: The jade plant, not unlike living sculpture, is tolerant of dry air, but needs ample light.

New cultivars will last for months with just a little care

POINSETTIAS IN THE HOME

Conrad B. Link

POINSETTIAS at Christmas are most decorative and with proper care may be induced to flower again. Plants received during the holiday season should be watered regularly to keep the soil moist but not continually soggy. They perform best when given as much light as possible. Full light is also essential if you intend to grow them for a second season of bloom. Normal room temperature is satisfactory, although the keeping quality of poinsettias improves if the temperature is slightly cooler at night. Avoid locations where there are rapid temperature changes or drafts, as this may hasten the premature dropping of leaves.

Modern cultivars of the poinsettia typically have a longer-lasting quality of the leaves and bracts (bracts are the showy modified leaves that new gardeners often confuse with flowers) than those of even several years ago. It is not uncommon, providing proper care is given, to have the bracts and leaves remain on the plant until spring. If you want your poinsettia to flower again, there are two methods to consider. One is to permit the plant to grow until ready for repotting in spring, as described below. A second method applies to plants that lose their leaves and bracts early or to ones that have passed their peak performance. Such plants should receive no water and their soil should be allowed to become dry. The remaining leaves and bracts will drop. The poinsettia is then put into a cool place and kept dry until ready for starting into growth again in late April or early May. At that time the plants are cut back severely, to 3 to 5 inches, and repotted into fresh soil. If originally there was more than one plant in the pot, these may be separated at repotting, into one plant per pot.

Use a soil or soil mixture that is loose, porous and well-drained. A satisfactory mixture is of a loam soil with some organic matter, such as peat, or perhaps an inert material as sand, perlite or vermiculite. After potting, the plants are thoroughly watered and placed in full sun, outdoors if possible. Once the new shoots are an inch or so long, begin fertilizing the plants. It is easiest for the home gardener to use the soluble fertilizers recommended for house plants. Fol-

Photographs by George Taloumis

A traditional and attractive way of growing poinsettias is with a fern which is planted in the pot at the same time as are the rooted cuttings of the poinsettia.

low directions on the label. Some gardeners, however, prefer to mix fertilizer into the soil before potting. For poinsettias as well as for other plants grown in pots, it is important to start with a well-prepared soil—one that will remain well aerated and drain after watering—because nutrients can be added after potting.

To prevent your poinsettia from becoming too tall, it is necessary to "pinch" or prune out the growing tip. The first time should be when the new growth is 4 to 6 inches long and again in late August or during the first few days of September. When pruning, cut immediately above the first fully developed leaf. On the normally self-branching kinds, one pinching may be sufficient as they regularly will produce side shoots.

When the night temperatures become cooler than 60° F. in late September or early October, bring the poinsettias indoors and place them near a window where they will receive as much natural light as possible but where at night, they will *not* receive any artificial light. This is important from about September 25 until color of the bracts shows in early December. The failure of poinsettias to flower under home conditions is generally due to the fact that being by nature short-day plants, any light in addition to the normal day length favors the plant in its vegetative growth, and does not allow for initiation and development of flowers. However, once the flowers form and color is present in the bracts the length of day has little or no effect. Thus, the added light in the home during the Christmas season to which your poinsettia may be subjected will not be injurious.

The most important red cultivars being grown commercially as potted plants are 'Eckespoint C-1' and 'Paul Mikkelsen,' and their pink and bicolor sports. Other cultivars are 'Red Baron,' 'Rudolph,' 'New Eckes White' and 'Red Velvet.' The newest development is the "self-branching" or basal-branching types. Such plants develop branches at most nodes on the stem and do not grow quite as tall. An important cultivar of this type is 'Annette Hegg' which has red bracts. There are also several color sports of it. A new bicolor cultivar of pink and white is called 'Marble.' ◆

WINDOWSILL ORCHIDS—
A Retrospective

Brenda Weisman

THE year of the "windowsill retrospective" began in our house when the dogs managed to open the greenhouse door in the very dead of a freezing night (10°F), thus demolishing our aging heating system, not to mention most of the plants. Oddly enough, the majority of the orchids survived, enabling us to go back to the "good old days" of windowsill growing, previously described in the Brooklyn Botanic Garden HANDBOOK ON ORCHIDS.

The basic rudiments of orchid care, such as watering, potting and pests, human or otherwise, are beyond the scope of this handbook and are more than adequately covered elsewhere. The following are subjective comments based strictly on personal observation and, in many cases, aggravation.

How Sunny is Sunny?

Any plant that is described as a greenhouse shade or semishade lover is a candidate for the sunny windowsill since most "sunny" windows either do not get a full day of sun or else are obstructed in such a manner (trees, buildings, etc.) that somewhat less than full sunlight results. Light coming through a window to one side of a plant simply does not compare in intensity to outdoor or greenhouse light. If, on the other hand, one is truly possessed of an unobstructed southern exposure, the possibilities become a matter of personal preference and judicious plant placement—sun-lovers near the window and shade-lovers near the room.

A Theory on Temperature

My theory on temperature is simple: The plant must survive in temperatures conforming to human standards of comfort—which can vary from hour to hour in our house. Bearing in mind, however, that it is cooler (and more drafty) near the window than in the room, the plants on the intermediate-temperature list should do well indoors—after considering other requirements. As regards temperature, plants are more flexible than people think; while one does not put a Cymbidium in a hot spot or a Phalaenopsis in a cold, drafty spot (nothing with leaves or feet should be in a cold, drafty spot), my green-leaved and mottle-leaved Paphiopedilums bloomed side-by-side with blithe disregard for their different temperature requirements.

The home can be considered an intermediate temperature situation with cooler or warmer micro-climates, depending on the windows involved. Just remember to place a few thicknesses of newspaper between plants and windows on very cold nights and also to either turn the radiators off under plant windows (usually impractical or, more likely, impossible in an apartment) or use a radiator enclosure lined with asbestos to redirect heat into the room.

Humidity

Previous experience indicated to us that anything over about a foot in height could be *maintained* in the house, but not generally in blooming condition—even after one has attended to light and temperature requirements. Our aim this winter was maintenance, so we lived in our little non-blooming jungle (not strictly true because some Maxillarias and Pleurothallids as well as *Dendrobium pierardii* and *Cattleya luteola* bloomed), but once having become addicted to orchids indoors and having learned something about light and temperature, the question of humidity assumes major proportions. This has presented more problems to both greenhouse and home growers than any other area of orchid culture.

A proper balance of temperature, light and humidity is basic to all plants, although some are more tolerant of variations than others in any given family or even genus. In general, orchids have higher humidity requirements than other plants, but again, individual plants exhibit great flexibility and very often those lists of "Easy Orchids I Have Grown" are as different as the people who write them. This is a situation where one person's meat may very well be another's poison. I, for instance, have had Phalaenopsis in bloom on the windowsill, but needed a greenhouse to see blooms on *Epidendrum tampense*, everyone's nominee to the ten easiest list.

The little plants—the miniatures, the dwarfs, and the barely macroscopic can be most satisfactorily humidified by placing them on wet pebbles. This treatment, which even works for some of the one-footers, with extra misting provided, is the most common means of raising humidity without tears, and has been more than adequate for *Brassavola nodosa, Apasia variegata, Isochilus linearis,* all sorts of Maxillarias and Pleurothallids, *Oncidium ornithorynchum, O. cheirophorum, Scaphosepalum verrucosum, Rodriguezia fragrans, R. venustum* and some tiny Epidendrums. This exotic list is merely a sampling of one person's tastes and permanent house guests. The possibilities are limitless; in fact, lack of restraint rapidly becomes a major problem, followed closely by overcrowded conditions for a plant family that absolutely requires excellent air circulation (but no drafts, please).

Our concern in this discussion is obviously with ordinary home conditions, not with the myriad ingenious devices, such as fluorescent lights, special enclosures and/or humidifiers, the latter two being most definitely required by large plants. Such large plants simply cannot be misted enough, but unfortunately beginning growers flock to large Cattleyas as lemmings to the sea. So, assuming that one has already been adopted by giants on the windowsill, two modifications are worthy of mention. The first is a clear, plastic window shade which can be pulled down on the room side of the plants to maintain humidity on sunny days or on the window side of the plants to keep out icy, night drafts. One acquaintance even used a fabric shade which she soaked on sunny days. The other is a very small rubber-bladed fan or blower mounted above the plants to keep the air circulating in the enclosed space, thus preventing heat build-up which is always rapid and damaging; moreover, circulating air is conducive to healthier plants and better blooms. The reasons still seem to be controversial, but the fact remains.

Marjorie J. Dietz

A windowsill orchid, cymbidium 'Kan Tan', blooms in winter and lasts for weeks in a cool window.

At this writing everything is vacationing either outdoors or in the more protected, but very airy greenhouse—a consummation devoutly, emphatically and aggressively to be sought by apartment dwellers in the summer. Well before the heating season, however, the smaller orchids will be back on our expanded kitchen windowsill and some 300 plants will be scattered through the rest of the house—because despite the advantages provided by the greenhouse, we find our plants most satisfactory close-up. ◆

The Easter cactus is very similar to the Christmas cactus, but blooms at a later date, usually from late winter to early spring.

A different kind of cactus

THE CHRISTMAS CACTUS

Frank Bowman

THE Christmas cactus (*Zygocactus truncatus*), as well as the Easter cactus, is a forest or jungle plant from South America. Accordingly, in the home, it and its numerous hybrids and relatives with flattened, claw-shaped, leaflike joints require different treatment from the common desert cacti that house plant growers know. (For *their* culture see the Brooklyn Botanic Garden Handbook on SUCCULENTS.)

Soil Requirements

Christmas cactus thrives in humus-rich, loose soil with good drainage and aeration. Given these conditions, the soil may be kept moist throughout the active growing season.

There is generally some shade where this epiphytic sort of cactus grows in its native habitat—not dense shade but broken sunlight. The path to success with Christmas cactus, or almost any house plant, is to simulate as nearly as possible the basic conditions in which it is found in the wild. So, in the home, it is best to avoid a location where this plant would receive the hot midday sun. A pleasing and culturally sound, though not essential, adaptation is to grow the Christmas cactus as a hanging basket plant.

Since Christmas cactus is found in nature in relatively cool, mountainous parts of Brazil, it should be no surprise that its greatest development as a pot plant in the United States usually occurs when grown in farmhouses and homes lacking the often intense heat and dryness of modern city apartments.

If Christmas cactus can be placed out-

This Christmas cactus, ornamental even when not in flower, is spending the summer outdoors on a terrace in light shade.

Photographs by George Taloumis

doors in summer, it will benefit. A protected porch or the shade of a tree is ideal. Rain won't hurt providing drainage is good.

Autumn Care

Many growers observe that the Christmas cactus may suffer if moved about too much. Therefore, it is wise to leave it in one spot for the summer. Before frost threatens in autumn, bring the plant indoors and put it on a cool, draft-free windowsill receiving good light, where it may remain until the following spring.

Christmas cactus should be rested until flower buds begin to form in autumn, and again after it has finished blooming. During these rest periods, keep it on the dry side but do not let it dry out completely. After the early autumn rest period, water the plant more often; also give it an occasional application of water-soluble fertilizer. Christmas cactus may be left in the same pot for many years, providing it is fertilized during the growing season and has not outgrown the pot.

One more tip: you will have more success in flowering the Christmas cactus if it is kept away from as much artificial light as possible in the home after you bring it indoors in the autumn. Like the poinsettia, it is a short-day plant and in fact requires curtailed light for flower bud initiation. (Commercial growers have found that eight hours of light for 45 days with the temperature between 50° and 65° F. will produce buds and flowers at any time of year.)

Flowers for Christmas

The windowsill gardener can easily cause his plant to flower around Christmas time by leaving it outdoors, away from artificial light, as late into autumn as possible, to take advantage of the cool weather and short days, provided the temperature stays above 40° and there is no heavy rain. When the plant is brought indoors—usually toward the end of October in New York City, it will probably have buds on it, and you can look forward to a fine display of red-to-purple flowers at holiday time. ◆

The aristocrats among house plants

GROWING BROMELIADS INDOORS

George Kalmbacher

THE common pineapple is the most universally known member of the bromeliad family. It is far surpassed in appeal as a house plant, though, by one outstanding species, *Aechmea fasciata,* which can usually be found in florists' shops over most of the world. Not only is its flower complex an eye-catcher, but it will last in good condition for a few months. This long-lasting quality of the beautiful inflorescence and succeeding berries, typical of many bromeliads, is not equaled in any other group of house plants.

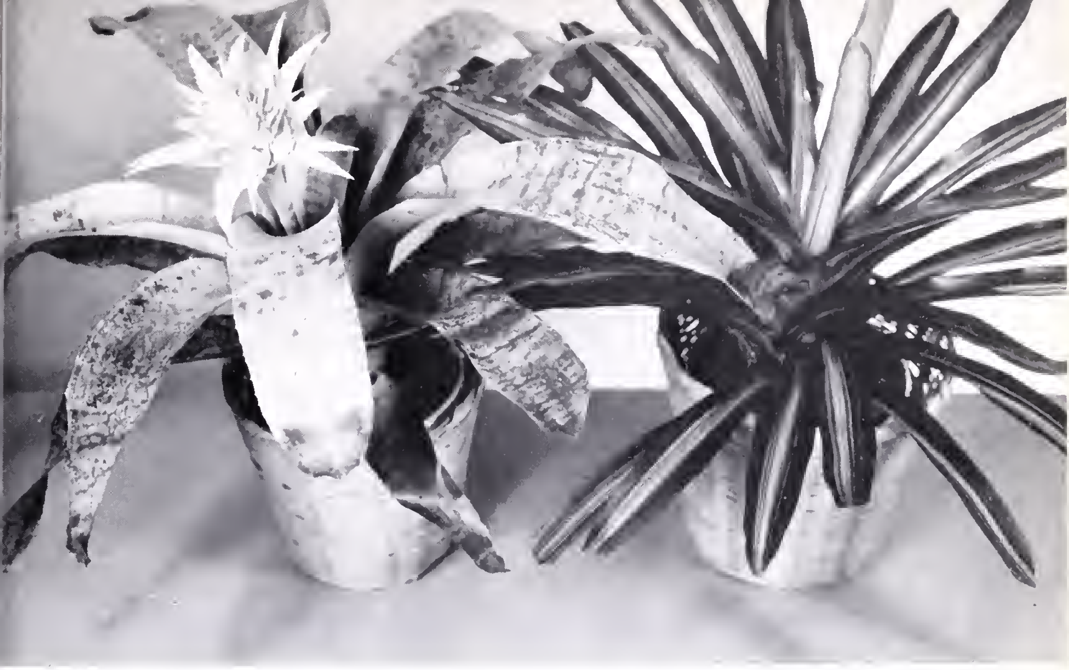
A great proportion of bromeliads grow in trees in the American tropics, the trees serving simply as a perch. Bromeliads do not derive nourishment from their hosts, but manufacture their own life-materials from the abundance of air-borne particles and debris of decaying plant and animal life. So they are not "parasites," and do not bore into their living hosts and suck out vital juices as do parasites.

Living up in the air perched on other plants, epiphytic bromeliads have evolved to a state unique among plants—one that presents two radical changes. The primary purpose of their roots has come to be fundamentally that of support. Their roots are so firmly attached to their hosts as to become practically cemented, and sometimes the area of attachment is very small compared to the size of the plant. The absorptive function of roots has been taken over by small white scales of complicated structure that act like sponges. In some Tillandsias, the whole leaf is densely covered with scales. In other bromeliads the scales are in broad bands attractively alternating with greenish bands. In fact, many of the cultivated kinds, even without flowers, are delightful the year around as foliage plants because of markings, spotting, coloring, banding and striping. Foliage attractiveness is further advanced by the introduction of "variegation" to normal leaves. This is the appearance of patches or lines of color which can be shades of yellow or pink or other color, or white. Variegation of bromeliads is usually in longitudinal stripes. From the edible pineapple plant has arisen a number of really remarkable colored multi-striped forms.

Functions of the "Water-tanks"

Most of the bromeliads grown as house plants are of a kind that might be called "water-tanks." These consist of large wide leaves spirally and closely arranged to form an elongated receptacle that will hold water without leaking. In some cases water will be further retained in lower leaves that form a basal scoop. The sides of the leaves in contact with the water take the place of the absorptive rootlets in other plants, drawing water and dissolved mineral and organic matter necessary for the life-processes of the plants. When applying fertilizer, it should be in liquid form in the case of the "tank" plants and placed in the water of these cups. In nature all sorts of animal and plant debris finds its way into these cups and decays there. When fully broken down, the minute resultants become part of a new cycle of life. This is compost at an aerial level. Some animals live, some die in these tanks. In addition particles of dust or larger matter, floating in quantity in those tropical areas, fall into the plants' "broth" to supply mineral and organic substances.

In the forested tropics with their year-round activity and vast wealth of organic life, epiphytic plants are a characteristic part of the scene. Not only bromeliads, but their companions—orchids, cacti, ferns—are scattered about, sometimes thickly, other times only lightly. It is an amazing sight to see a great



Photographs by George Taloumis

Aechmea fasciata (left) in flower and *Neoregelia carolinae* 'Tricolor'. The Neoregelias develop striking foliage colors just before flowers are produced.

tree loaded with a large population of such plants, making a massive community of green heterogeny—and some colorful flowers as well.

In strange contrast, there are in desert regions of tropical America, a few kinds of epiphytic bromeliads attached to large cactus plants. And there are also bromeliads that are not epiphytic at all. Some grow on rocks as their regular habitat, some in soil. Of these three types, there are a number that have become unusual subjects for cultivation in homes, greenhouses and outdoors where the climate is warm enough. In fact, outdoor growing, not surprisingly, makes the healthiest plants. If possible, put your bromeliads outdoors when weather is no longer hazardous for them; hang them up in trees or place them under trees where the shade is not dense—and bring them back before cold weather sets in.

Bromeliads have a common system of vegetative multiplication. From seed comes a rosette which will flower in time, but as it grows, it develops low branches or rhizomes, each of which in time develops its own rosette which eventually can be cut off and rooted to become a new plant. Flowering arises from the center of the mature rosette, as a final act, after which it gradually dies. These offsets are commonly called "pups," a term also used in cactus growing. They are usually stocky. Do not cut them off from the mother plant until they are a few inches long.

Bromeliads for Beginners

The most reliable genera for beginners to start with are the Aechmeas and Billbergias. They want good light, and need only water in their cups. The Aechmeas are remarkable for their long lasting flower and berry complexes, sometimes in large panicles. The flowers are small and not nearly as showy as the Billbergias, but produce berries without obvious pollinization. These solid full berries go through color changes that are highly pleasing, and which altogether last for a few months. The foliage of the various sorts has a great range of attractive banding or other patterns, involving a number of different colors and shades. One common color range is in the metallic wine-reds with very glossy finish.

Some species are found in nature that are typically green, but have varieties that are dark red on both sides of the leaf, or sometimes only on the underside. The leaves are usually large, and the habit upright and cup-shaped. They require a very porous growing mixture—no soil, but plenty of fibre, some inert material such as river gravel, coarse perlite or granite chicken grit, and organic material such as leafmold. It is not necessary to carefully measure the amounts of each, but a heavy proportion of fibre is advisable. In with the mix, scatter well osmocote, a fertilizer consisting of small round white particles that disintegrate over a long period of time—actually about six months. Among the Aechmeas, the following are well-known: *chantinii; fasciata; fulgens* and its variety, *discolor; gamosepala; luddemanniana; miniata* and its variety *discolor; orlandiana; racinae* and *tillandsoides*. There are colorful hybrids such as *A.* 'Foster's Favorite,' 'Royal Wine,' etc.

The Billbergias require similar culture, but are distinct from the Aechmeas in that their tubular flowers are richly colored, larger and very obvious. They come in loose racemes or panicles on long stalks. They put on a show, which, however, lasts only about a week. Since they grow freely and abundantly, clumps develop if undisturbed, and when a number of rosettes in a clump come into flower, it can make a truly grand picture. The very easy and popular grower, *Billbergia nutans,* is a great favorite in many countries.

Unlike the Aechmeas, the Billbergias do not usually produce seeds in cultivation but hybridize rather easily in nature. Some offspring are not especially distinctive. However, one of the best known plants in the bromeliad family has been *B.* 'Fantasia'; and *B.* 'Catherine Wilson' and 'Muriel Waterman' are favorites. The first two are heavily spotted with white, the latter has beautiful barring and coloration.

Neoregelias and Nidulariums should be given the same regimen as the Billbergias and Aechmeas, except that being softer-leaved, they require a little less light. Both kinds are more open plants, ranging from fairly upright to flattish in habit. They are often considered together because of the colorful areas in the foliage that develop before flowering time, and become more pronounced during the flowering period, which may last for a couple of months or more. In the Neoregelias, the flower complex is a large disc in the center, from which single or a few flowers arise at a time over a long period. In the Nidulariums, the inflorescence is at the top of a stout stalk with colorful bracts or floral leaves intermixed. The flower stalk may not be obvious.

Among the most striking kinds are the Vrieseas, but they are delicate to a certain extent. The inflorescences with their bracts, which are often colored rich dark red, enclose individual flowers that bloom one at a time. They are often upright, flattened long spikes. If they are packed tightly in 4-inch pots with fern fibre and nothing else, they may not give any trouble, since the drainage is perfect and they will not suffer from water damage, which is probably the great hazard to their successful culture.

There are more Tillandsias than any other kinds. Most of them have long, very narrow leaves. A number of Tillandsias are attractive for their foliage because of the thick coating of tiny silvery scales. They, like the closely related Vrieseas, are very susceptible to water remaining about the roots and plant-base, and are best mounted on cork, fern bark or driftwood, with only some fern fibre close around the base. They can be securely fastened by putting a little Duco Cement on the wood or bark at the point where the plant is to be attached, and setting the base of the plant in the cement. It takes a short time to dry and then holds the plant in place, where it can proceed to grow a few roots in the manner of Tillandsias. They thrive with very little root development. Tillandsias do best in cultivation with misting. Give a good soaking once a week. They do well without fertilizer.

All the above mentioned bromeliads do

best in a humid environment. But care must be taken not to overwater—they can withstand dryer conditions than one would expect.

Some Terrestial Bromeliads

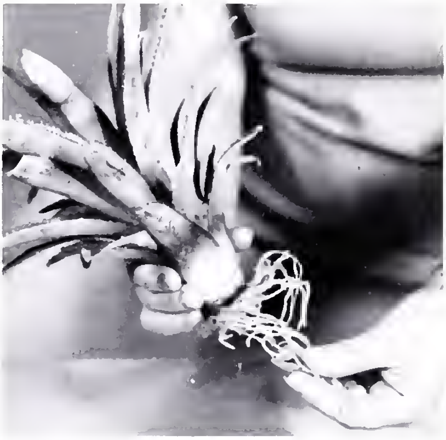
Cryptanthus kinds are terrestials, some flattened like stars, and a number have unusual coloring not found in the other genera. They usually have white flowers low in the center of the plant. Strangely, they do best with the same mixture as the epiphytes. They will do their best if given less water than the epiphytes, but do require humid surroundings.

Bromeliads are remarkably free from pests, but scale can be a problem. These roundish, raised and stationary insects can be easily rubbed off when they first appear—if one is on the constant lookout for them.

To grow more plants than window light affords, the use of artificial lighting presents opportunities to extend one's collection. "Naturescent" tubes are excellent and are just about the right requirement, resulting in coloration and growth that is highly satisfactory. ◆

●

Step 1: Slice the top off the fruit.



Ready for potting—roots have formed.

HOW TO GROW A PINEAPPLE

Pineapple plants may be grown from pineapple tops. To do this, first cut off the plant's top with about one inch of fruit. Trim the flesh away to the hard stringy tissue. Allow the cut surface to dry for 2 or 3 days; this will promote the formation of a protective layer which will prevent decay of the cut surface. Then, prepare a soil mix or use soil purchased at a garden or variety store—the kind of soil used for African-violets is satisfactory. Insert the pineapple into the soil mix, placing the bases of the lower leaves level with the surface of the soil. You may have to insert a stake or two to tie the pineapple top in an upright condition. Give the plant sufficient light, but do not place it in direct sunlight. Night temperatures should range from 65° to 70° F. The plant will not root in a soil mix that is always wet, so let the soil dry out before rewatering. Grow your pineapple as you would any house plant that requires little maintenance. Water and fertilize at frequent intervals.—*U.S. Dept. of Agriculture*

A TERRARIUM CAN BECOME A MINIATURE WOODLAND

Elsie T. Hammond

A PLEASING hobby for indoors is the making and care of a terrarium, for in this way a favorite bit of woodland or a miniature greenhouse may be brought into the home or school room. Terraria are inexpensive to make and easy to look after.

The first consideration is a container of clear glass or plastic with a glass top. A rectangular 2-gallon aquarium is a convenient size, although a larger one of 6 gallons or more gives greater scope for originality of arrangement and choice of plants; but even a very small container such as a fruit jar with a bit of moss and a wild fern or two is worth having. Round bowls, filled with partridge berries or other material, and rectangular tanks with chrome steel or aluminum frames are traditional terrarium containers.

After procuring the container, the next step is to decide on the type of plants to be grown. Do not mix woodsy material and house plants. Have one or the other, as the combination is unnatural and the needs of each are generally different. Wild things, such as mosses, ferns, lichens, creeping vines and various small flowers, are more interesting to most people. These natives of the woods grow low on the forest floor or on rocks where the soil is very rich but usually without much depth. Here it is damp and only a filtered light or a little sunshine sifts down through the tree tops. Most house plants, on the other hand, grow in a good garden loam, and require a warmer temperature than the wild ones.

In planting the terrarium plants, it is well to remember that in the woods where these plants grow, the ground is not always flat but is often uneven and hilly. Stones and cliffs rise, there are fallen tree trunks covered with ferns, fungi and lichens and there are depressions carpeted with mosses and dainty flowering plants. And so as natural a scene as possible should be planned.

A layer of fine clean gravel, about an inch thick in the front to two or more in the back, should be spread over the floor of the container to insure drainage. The gravel should be heaped up in the back or at the ends to form a hill or slope and brought almost to the glass front. Over this foundation spread a layer of fine leafmold or soil similar to that in which your plants have been growing. The soil need not be more than an inch in depth, except in the back where it is built up, or behind ledges or on sharp slopes. Next, place one or more irregular rocks where they will look like natural outcroppings or ledges.

After the drainage layer and the leafmold have been prepared, assemble the plants; lay them on top of the soil to get the picture of how they will appear when planted. When the arrangement is satisfactory, begin to plant.

Put the moss or ground cover in place and press it down firmly. There will be enough soil adhering to it so it will need nothing more. Tuck it down between the glass front of the container and the soil, so the latter will not show. The larger plants naturally go toward the back. With a sharp pointed stick make holes through the moss, gently work the roots into the hole so formed, and with the fingers press the soil and moss around them. Arrange ferns and vines to fall over the ledges or to grow in the shadow of boulders. Smaller plants should be placed near the front of the terrarium. A piece of partly decayed wood with lichens on it can simu-

This crystal plastic terrarium is called a terrasphere and is an example of some of the newer designs in enclosed gardens. It has been filled with house plants rather than woodland plants, although a miniature forest could be created in it as readily as this tropical rain forest

Christen Inc. and Natural Gardening

late a fallen tree trunk; and if the terrarium is large enough, there may be a small pool made by sinking a small glass or porcelain dish until the rim is flush with the mossy floor. Do not use tin of any kind, as it will rust and become unsightly.

Kinds of Plants

A word as to the mosses to be used. They are of three types: those that form a perfectly flat carpet, among which are the fern mosses and many of the hypnums; those that grow in round fashions, such as the silvery white leucobryum or cushion moss; and those that grow in large, more upstanding patches, of which the tree moss (*Climacium*) is the loveliest. Others are the pigeon wheat (*Polytrichum commune*) and the juniper hair cap mosses (*Polytrichum juniperinum*). Collect them in the fruiting stage, with the spore cases standing up, if possible. It makes for variety and interest to have one or more of each type, though the first is the best for the main floor covering.

Ferns should be small; any that fulfill these requirements may be used. Perhaps the very best is the common polypody (*Polypodium vulgare*) which is easily collected in the form of tiny specimens up to any size that is desired. Small woodsia, (*Woodsia obtusa*), Christmas (*Polystichum acrostichoides*), ebony spleenwort (*Asplenium platyneuron*), maidenhair (*Adiantum pedatum*), and beech (*Phegopteris polypodioides*) ferns are good, to mention a few. If any of them grow too big they can easily be removed or cut off.

Seedlings of hemlock, pine, spruce, or fir will give height where needed. Pieces of lycopodium (*Lycopodium obscurum*) or "ground-pine," as it is commonly known, look like thrifty evergreen trees. Deciduous tree seedlings, true to their habit out-of-doors, will drop their leaves. Yet, for a short time in the autumn, very small red maples are admirable material because they lend a wonderful touch of color to the scene. Tiny maples, birches, or oaks take up very little room. If placed in the terrarium during late fall or winter, their buds begin to swell very early and the young leaves come out, showing that spring is on the way.

The terrarium is predominantly green, but spots of vivid red may be furnished by the berries of wintergreen (*Gaultheria procumbens*) or partridge-berry (*Mitchella repens*), the latter a satisfactory little vine that will root itself wherever it has a chance. Another vine-like plant growing on the forest floor is twin-flower (*Linnaea borealis*), so named for the tiny twin pink flowers it bears in the summer.

Pipsissewa (*Chimaphila umbellata*) is

Visual Design Manufacturing Co.

Plastic cubes offer gardeners greater scope in terrarium creativity.

New Looks and New Ways of Terrariums

Until recently, goldfish bowls and tropical fish tanks were the most often encountered receptacles for enclosed miniature gardens. Now there is more variety in both glass and plastic designs, ranging from the sphere-shaped container on page 51 to pure egg shapes, available as a standing model or as hanging unit. The plastic cubes above are especially appropriate in contemporary interiors. Although not new but now more widely available in gift shops and department stores are apothecary jars and ginger jars, as well as other unusual glass bottles which can be transformed into terrariums or bottle gardens by imaginative gardeners.

The time-favored woodland scenes with woodland plants, as described in the article beginning on page 50, can be created in the new containers, or many of the small-leaved house plants that are in scale with the container and able to thrive in its confined, moist atmosphere can be selected. Especially suitable ones include table ferns, miniature sweet flag, fittonia, creeping fig, baby's-tears and, among flowering plants, small orchids, episcia and the miniature *Sinningia pusilla* and its varieties.

A new use for a large, leaky old fish tank: The current vogue for glass or clear plastic tables led me to convert a mammouth rectangular fish tank (destined for discard) into a functioning glass-topped cocktail table. The table also serves as a terrarium and contains three potted fern plants which stand on a layer of white pebbles.—*Marjorie J. Dietz* a coveted plant for the terrarium because of its lovely waxy flowers and handsome evergreen leaves; and equally good is the spotted wintergreen (*C. maculata*), its glossy beautiful green leaves marked with white. Another remarkably attractive foliage plant is the rattlesnake-plantain (*Goodyera repens*), an odd little orchid whose green leaves, marked with white, form handsome rosettes.

There are many small flowering or foliage plants that may be added to this miniature woodland scene, such as little violet plants, miterwort, hepatica, anemone, mountain oxalis, and gold-thread.

Very small shelf fungi on pieces of dead wood, or little puff balls are attractive. Mushrooms, however beautifully colored, are definitely to be avoided, as they quickly decay, causing much trouble. Lichens, especially the cup cladonias and some of the leafy looking, grayish-white parmelias, are good. The red cap cladonia, known as "British soldiers" adds a charming touch of color. While they may not last as long as some of the other green things, they can be easily removed without disturbing the rest. A small bit of one leafy liverwort may be tucked in a bare spot, but it is apt to grow very fast, taking up valuable space.

Water and Light Requirements

After the planting has been completed, it is time to water the terrarium. This should be done gently; never pour in a heavy stream of water. A small rubber bulb for watering plants is excellent. The terrarium should be thoroughly watered but not soppy. It is a good plan to have a little water in the gravel layer, but the soil should be only damp, not wet. The glass cover of the container not only keeps the dust out and the temperature equable, but holds the moisture in, so that it should not be necessary to water every day. There is no hard and fast rule for watering; only by watching is it possible to keep the amount of moisture right. If a white or brown mold appears, or the plants begin to rot, there is too much water. In that case the cover must be removed for a time and the affected plants removed. A terrarium can last in good condition for many weeks or even months on its initial watering. If any of the plants begin to shrivel or look dry, sprinkle them well.

Almost all plants enjoy some sunlight, so the terrarium can be kept in a window having some sun during the winter months when there are so many gray days. If it gets too hot, move it back a little from the window front. It thrives better if kept cool. If no sunny window is available the terrarium will do as well or better in good diffused light. Or place it under fluorescent light for 12-15 hours a day.

Following is a list of plants suitable for a woodsy terrarium.

Ferns
Christmas—*Polystichum acrotichoides*
Maiden Hair—*Adiantum pedatum*
Polypody—*Polypodium vulgare*
Woodsia—*Woodsia obtusa*

Mosses (Various species)
Broom—*Dicranum*
Fern—*Thuidium*
Cushion—*Leucobryum*
Pinnate & Plume—*Hypnum*
Hair Cap—*Polytrichum*
Tree—*Climacium*

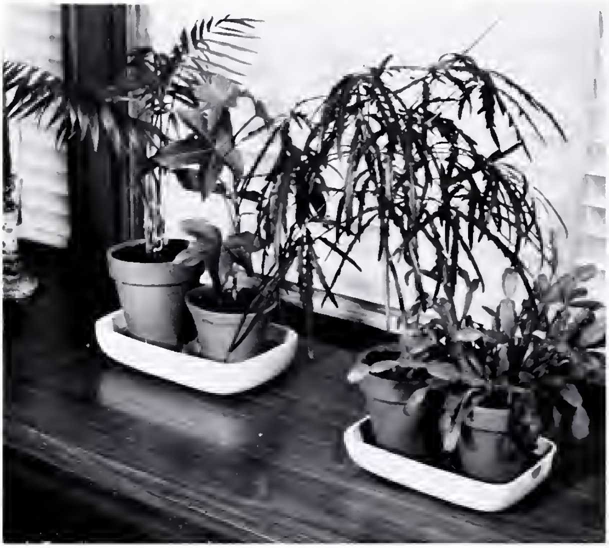
Lichens
Cup Cladonia—*Cladonia fimbriata*
Red-topped Cladonia—*Cladonia cristatella*
Parmelia—*Parmelia*
Reindeer Moss—*Cladonia rangiferina*

Club Moss
Lycopodium obscurum

Flowering Plants
Anemone—*Anemone quinquefolia*
Canada Mayflower—*Maianthemum canadense*
Goldthread—*Coptis trifolia*
Hepatica—*Hepatica triloba*
Miterwort—*Mitella diphylla*
Partridge-berry—*Mitchella repens*
Pipissewa—*Chimaphila umbellata*
Rattlesnake-plantain—*Goodyera repens*
Spotted Wintergreen—*Chimaphila maculata*
Shinleaf—*Pyrola* spp.
Twin-flower—*Linnaea borealis*
Violet—*Viola* spp.
Wintergreen—*Gaultheria procumbens*
Wild Strawberry—*Fragaria* spp.

Basic care at a glance . . .

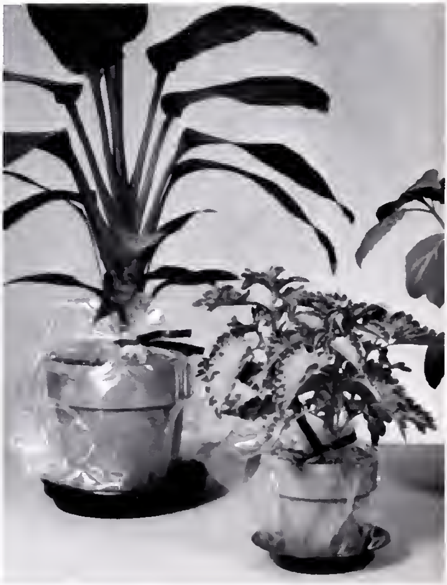
HOUSE PLANT PRIMER



HUMIDITY Even a few plants grouped together to stand on pebbles in water-filled trays will benefit from the increased atmospheric moisture. The trays shown here are decorative and small enough so they can be shifted about handily. The water in the trays should be maintained at a level just below the surface of the pebbles so the pots do not sit constantly in water.

Photographs by George Taloumis

FERTILIZING House plants in active growth (usually from early spring to fall) can be fertilized at monthly intervals.

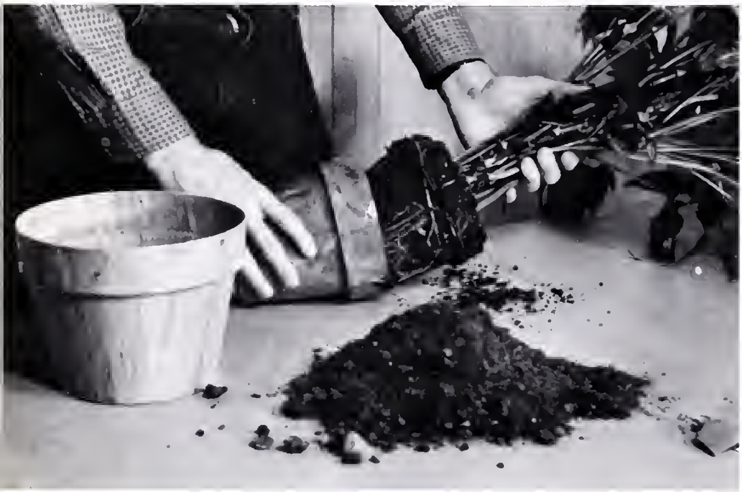


VACATION CARE Inserting the pots of house plants in plastic bags prevents the soil from drying out.

POTTING SOILS Apartment dwellers can buy prepared mixes. Gardeners with soil, peat moss, compost and other ingredients at hand can prepare their own mixtures. See page 19 for specific suggestions regarding potting mixes.

POTTING HOUSE PLANTS Do not put plants in too large pots. Usually there should be about ½-inch space for potting soil around the plant when it is placed in its new container. Leave ample space at the top of the pot for water.

(*Continued*)



REPOTTING Most plants require repotting when their roots have filled the available potting mixture. This can be determined by carefully knocking the plant from its pot (see page 7).

GROOMING House plants greatly benefit from having their foliage washed to remove dust and soot deposits as well as infestations of red spider mites. In the summer, bathe them with a hose; indoors place them under a shower or faucet.

PROPAGATION Many plants will root when their stems are placed in water. Shown are zebrina and lamium. Others include ivy, Chinese-evergreen and African-violet.

PLASTIC BAGS Cuttings can be inserted in pots filled with sand and peat moss which are enclosed in plastic.

EPISCIA CUTTING This episcia, an African-violet relative, has formed roots and top growth in glass of water.

HOUSE PLANT PEST CONTROL

Anne Birdsey Ginns

SENSIBLE treatment for a pest-ridden house plant is quick deposit in the garbage. It is usually much easier to replace a badly infested plant (and too often when injury is noticed the pests have the upper hand) than to attempt a long, involved "cure." However, if the plant is valuable or at an early stage of decline, it is worth some effort to achieve a cure.

First, determine the plant's identity. This is important since some insects typically infest certain plants, making it easier to pinpoint the problem. Also, some insecticides may damage certain plants.

Next try to identify the pest. It may be possible to control it without resorting to poisonous chemicals. Because of the danger of contaminating the household, it is best to avoid chemical sprays that require measuring, mixing and use of equipment that must be cleaned thoroughly after use. It is often difficult to dispose of leftover solutions, without pouring them into the sewer system where further uncertain distribution only spreads the contamination.

It is most practical to invest in pest killers that will eradicate a wide range of insects. Convenient to keep on hand is an aerosol can of a multi-purpose insecticide. Be sure the directions specify use on

George Taloumis

An aerosol can containing a multi-purpose insecticide is a convenient means of controlling most house-plant pests. Follow directions on the container.

plants. Read instructions carefully. For further protection, avoid spraying in kitchen areas. Use a room that can be closed off for several hours at least. If this is impossible, place the plant in a large bag, spray into the bag and close tightly. Leave for several hours.

Pest strips or plastic bars impregnated with Vapona Insecticide are effective against many kinds of insects. There is now some doubt that these strips are as "safe" for general use as first thought, but for controlled fumigation of house plants they are quite useful. To fumigate, place the plant (its leaves should be dry, the soil barely damp) in a large plastic bag or garbage can with a tight lid. Carefully unwrap the Vapona strip and place alongside the pot. Close the bag or can and leave overnight. Do not allow the bag to remain in sunshine as temperatures above 80° F. can cause plant injury. (At temperatures below 60°F. treatment may be ineffective.) Tear the bag open, if necessary, to remove the plant after treatment. Do this in a well-ventilated area. Rewrap strip in original package and seal for reuse. Discard the bag.

Systemic insecticides—those which are absorbed into and translocated through plant tissue—provide longer lasting protection from many pests. Products which are sold in granular form are the safest to use and easiest to apply to soil surfaces. Use great caution with systemic insecticides. Follow package directions exactly.

Interestingly, the four major insect pests of house plants belong to the same order Homoptera. They are aphids, mealybugs, scale and whiteflies. All are sucking insects.

Aphids, usually green or brown, are small, soft-bodied, and pear-shaped, with or without wings. They secrete "honey-dew" or sticky drops on foliege or surfaces beneath the plant. Aphids prefer tender young growth and flower buds, which after attack become stunted. Aphids also cause leaves to curl and drop. A strong shower of water will wash these pests down the drain or they can be readily killed with an insecticide, but a careful watch should be kept because repeated treatments are usually necessary.

Mealybugs have grayish-white scruffy secretions over their oval, ¼-inch bodies. Their cottony egg masses are most obvious. The safest way to eradicate minor infestations is to touch each insect or egg mass with a cotton swab dipped in alcohol. Otherwise use the pest-strip treatment or a systemic poison.

Scale insects are usually so closely attached as to appear part of the plant, and they often go unnoticed. They secrete "honey-dew" which is more obvious. An aerosol spray will kill young scales in the "crawler" stage. Pick mature scale insects off by hand or use a systemic poison.

Whiteflies hide and work on the undersides of leaves. Adults resemble tiny white moths, immature stages resemble scale. "Honey-dew" is secreted. Try a systemic poison, otherwise be prepared to spray or fumigate repeatedly since immature stages are very difficult to kill. Beware of the Christmas poinsettia. All too often whiteflies arrive at your home hidden under its leaves.

There is a higher price paid than the one on the container when insecticides are used. It is inevitable that some natural predators will be killed at the same time, allowing other pests to multiply out of control. This probably accounts for the superabundance in recent years of mites, tiny relatives of spiders.

Spider mites or red mites are serious plant pests. The damage they cause by sucking plant juices is usually the first sign of their presence. Leaves begin to lose normal color and take on a burned or dusty appearance. Upon close inspection fine webbing and mobile specks can be seen. If caught early, spider mites may be controlled by frequent strong showers of water. Systemic poisons, an aerosol spray or fumigation methods work but must be repeated frequently. To keep ahead of this pest learn to recognize it at once. Spider mites seem to thrive in dry rooms where humidity is low.

Some insects associated with house plants annoy the grower more than the plant. Fungus gnats and springtails fall into this category. Their presence is usually a sign of over-watering. They exist primarily on decaying organic matter in the soil, and do little or no harm but may be obnoxious to some people. Simply letting soil surfaces dry between waterings will discourage them. Otherwise try watering with 1 teaspoon of chlorine liquid bleach diluted in 1 quart of water. Always use pasteurized potting soil. Fungus gnats resemble small blackish mosquitoes. Springtails are named for their jumpy movements. The species found in potted plants is whitish in color and minute in size.

Fortunately, few fungus diseases trouble house plants, probably because most homes are dry as deserts. In situations where there is high humidity and poor circulation, mildew can become a problem, however. Fresh air—but no drafts—and fine sulphur dusted over the plant should end the mildew, which looks like a grayish-white powder dusted on leaves and stems. Later these affected plant areas will shrivel and dry up.

It is much easier to avoid pest problems than to cure them. Remember the basics: Always use pasteurized soil, achieved by baking the moist soil in the oven at 200° F. for 1 hour. Use sterilized containers to pot plants. Keep plants free of dust and dead leaves and blooms. If possible isolate each newly acquired plant for at least two weeks, and examine it carefully before introducing it into a healthy collection. ◆

TERRARIUMS

Brenda Weisman

In terrarium plants must live
So too much water do not give.
When water ceases to condense
For this lack we recompense.
Likewise when soil turns dark to light
Adding water is quite right.
Never, never a deluge, pray—
Rather drop a gentle spray.
At excess growth we deeply frown
When this occurs cut way, way down.
Place anywhere for decoration
Yet each day give a long vacation
Near lamp or window very bright
But please avoid direct sunlight—
Also extremes of heat and cold.
So if you do as you've been told
In this very horticultural rhyme
Your terrarium will last a
                    long
                        long
                            time.

BOARD YOUR HOUSE PLANTS IN THE FAMILY BATHTUB

Robert S. Tomson

WHEN you go away on vacation, it is often harder to find someone who will board your house plants than your Saint Bernard, which can at least be put in a kennel. Put the family bathtub to use as I do, and you can leave your plants alone at home for three weeks or so with a good conscience.

Let room-temperature water run into the tub so that the shallow end is 1¼ inches deep. Depending on the make of the bathtub or the sag of your house, the deep end will have 2-2¼ inches of water in it. Put larger pots at the deep end, smaller ones at the shallow. Even if you have a miniature botanic garden on your windowsill, the chances are that the tub will accommodate all of the plants. Don't be afraid to crowd them, for no harm comes of this in their temporary home.

Bathtub Leak

To avoid plants being left in the tub with no water while you bask in false confidence on a sunny beach, you had best make a trial run a day or two before leaving. Your bathtub may have leaks you never dreamed of. If the drain lets you down, place over it a rubber pancake-shaped stopper, available from any hardware store, and bathtub Sahara will be averted.

Light

Some etiolation—abnormal elongation of shoots due to insufficient light—may be expected within two weeks, but the average house-plant grower is happy just to have the plants survive the family vacation. A judicious pruning of any gaunt shoots soon results in a shapely plant again. To minimize etiolation, leave the bathroom light on while you are away.

If you have especially valuable or show-size plants that you want to have pull through your vacation in prime shape, you might hang an electric light fixture over the bathtub. *Caution*: water and electricity pose the same dangers to would-be vacationers as they do to everyone else, so don't try to save time by rigging up a light while touching or filling the tub.

The very keen grower, if he is going to be away for some time, is apt to think seriously about the ideal light intensity for plants, even bathtub ones. Most manuals measure light intensity in foot-candles. Foot-candle requirements of common house plants are given in the Brooklyn Botanic Garden Handbook, GARDENING UNDER ARTIFICIAL LIGHT (see rear cover of this handbook for ordering information), and the USDA *Home and Garden Bulletin No. 187,* available for 15¢ from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. General Electric makes a light meter, type 213, which measures light in foot-candles. Information is available from the Large Lamp Dept. of G.E., Nela Park, Cleveland, Ohio 44112.

Plastic Bags

If you have just a half-dozen house plants and don't plan to be away long, consider putting the pots in plastic bags instead of resorting to the bathtub. First, water each plant thoroughly. Then, tie the bag loosely around the top of the pot. The bag will serve as a mulch of sorts, delaying evaporation. However, do *not* put the entire plant in the bag, for the excessive humidity will almost surely result in a fungus condition, possibly root rot, marred foliage and premature death. However, judiciously used, the bag treatment avoids green thumb bathtub ring and possible arguments over who cleans out the tub at vacation's end. ◆

Further readings on the

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House Plants. Col. Illus. New York, Funk and Wagnalls Co., 1968. $7.95

Fenten, D. X.
Plants for Pots: Projects for Indoor Gardeners. Illus. Phila., J. B. Lippincott Co., 1969. $4.95—For younger readers

Fitch, Charles M.
The Complete Book of Houseplants. Illus. New York, Hawthorn Books, 1972. $9.95.

Jenkins, Dorothy H. and Helen van Pelt Wilson
House Plants for Every Window. Rev. Ed. Illus. (Paperback Library) New York, Publishers Distributing Corp., 1969. 60¢

Kramer, Jack
Garden Under Glass; the Miniature Greenhouse in Bottle, Bowl or Dish. Illus. New York, Simon and Schuster, 1969. $4.95

Kranz, Frederick H. and Jacqueline L.
Gardening Indoors Under Lights. Rev. Ed. Illus. New York, Viking Press, 1971. $7.95

Langer, Richard
The After-Dinner Gardening Book. Illus. New York, The Macmillan Co., 1969. $4.95
—Many fascinating projects including the growing from seeds of avocados, lemons, oranges, date palms, litchis, etc.

McDonald, Elvin
The World Book of House Plants. Illus. New York, Popular Lib., 1972. $1.25.

Nehrling, Arno and Irene
Propagating House Plants: for Amateur and Commercial Use, Rev. Ed. Illus. New York, Hearthside Press, 1971. $6.95.

Nicolaisen, Age
Pocket Encyclopedia of Indoor Plants in Color. American ed. Col. illus. New York, The Macmillan Co., 1970. $4.95
—Jerome Eaton, editor of this American edition.

Schuler, Stanley
One Thousand One House Plant Questions Answered. (Paperbooks) Illus. New York, Funk and Wagnalls Co., 1968. $1.50. Cloth ed.: New York, Van Nostrand-Reinhold Books, 1968. $6.95

Selsam, Millicent E.
How to Grow House Plants. (Morrow Junior Books) illus. New York, William Morrow and Co., 1960. $3.78
—For younger readers.

Sunset Staff and Barbara Pesch, eds.
How to Grow House Plants. Illus. Paper. Menlo Park, Cal., Lane Magazine and Book Co., 1968. $1.95.

Sutcliffe, Alys
House Plants for City Dwellers. (Dutton Garden Guides) Illus. New York, E. P. Dutton and Co., 1964. $4.50

MAIL-ORDER SOURCES FOR HOUSE PLANTS

Mary Jane Connors and Frederick McGourty, Jr.

LOOKING for certain unusual house plants? If you are unable to obtain them locally, the following list of mail-order firms may be helpful. In addition, the various plant societies (see inside back cover) can usually point you in the right direction for especially hard-to-find cultivars. This list, which gives the price of catalogs, has been compiled strictly for the convenience of readers and does not imply an endorsement of any particular firm. Omissions should be brought to the attention of Mary Jane Connors at the Botanic Garden. For list of orchid nurseries, see the Brooklyn Botanic Garden Handbook on ORCHIDS. (Ordering information is given on the rear cover of this Handbook.)

African-Violets and Their Relatives

Arndt's House Plants, 20453 N.E. Sandy Blvd., Troutdale, Oregon 97060. 15¢. Hoyas, too.

Buell's Greenhouses, Eastford, Connecticut 06242. $1.00.

L. Easterbrook Greenhouses, Butler, Ohio 44822. 50¢. Also begonias, ferns, other house plants.

Fischer Greenhouses, Linwood, New Jersey 08221. 15¢.

Fischer's Quality African Violets, 32 Downsview Ave., Downsview 464, Ontario, Canada. 15¢.

Flora Greenhouses, Box 1191, Burlingame, California 94010. 10¢. Also ferns, terrarium plants.

Lauray of Salisbury, Undermountain Rd., Salisbury, Connecticut 06068. Catalog 35¢. Begonias and fuchsias, too.

Lyndon Lyon, Dolgeville, New York 13329.

Richter's Greenhouse, 9529 Indianapolis Blvd., Highland, Indiana 46322. 10¢.

Tinari Greenhouses, 2325 Valley Rd., Huntingdon Valley, Pennsylvania 19006. 20¢.

Volkmann Bros. Greenhouses, 2714 Minert St., Dallas, Texas 75219.

West Coast Gesneriads, Box 16203, San Francisco, California 94116. 10¢.

Wyrtzen Exotic Plants, 165 Bryant Ave., Floral Park, New York 11001. Begonias, too. No shipping.

Bromeliads

Bennett's Bromeliads & Bonsai, Box 1532, Winter Park, Florida 32789. Send stamped envelope.

Cornelison's Bromeliad Nursery, 225 San Bernadino St., North Fort Myers, Florida 33903. Send stamped envelope.

Fuchsia Land, 4629 Centinela, Los Angeles, California 90066.

Jenkins Nursery, Box 702, 320 E. 33rd Ave., Covington, Louisiana 70433.

Marz Bromeliads, 10782 Citrus Dr., Moorpark, California 93021. 16¢.

Plaza Nursery & Flower Shop, 7430 Crescent Ave., Buena Park, California 90620.

Seaborn Del Rios Nursery, Rte. 3, Box 455, Escondido, California 92025. $1.00.

Williford's Nursery, Box 511, Rte. 3, Smithfield, North Carolina 27577. 16¢.

Cacti and Other Succulents

Abbey Garden, Box 167, Reseda, California 91335.

Beahm Gardens, 2686 Paloma St., Pasadena, California 91107.

Cactus by Mueller, 10411 Rosedale Hwy., Bakersfield, California 93308. Send 8¢ stamp.

Cox's Epiphyllum Nursery, 90 McNeill St., Encinitas, California 92024. 15¢.

Davis' Cactus Garden, 1522 Jefferson St., Kerrville, Texas 78028.

A. Hugh Dial, 7685 Deer Trail, Yucca Valley, California 92284.

Grigsby Cactus Gardens, 2354 Bella Vista Dr., Vista, California 92083. 20¢.

Helen's Cactus, 2205 Mirasol, Brownsville, Texas 78520. Send 8¢ stamp.

Kirkpatrick's, 27785 DeAnza St., Barstow, California 92311.

Modlin's Cactus Gardens, Rte. 4, Box 3034, Vista, California 92083.

(*Continued*)

A group of house plants which will thrive in a north window. Included are syngonium, Japanese aucuba, pothos, a fern and prayer-plant.

George Taloumis

New Mexico Cactus Research, Box 787, Belen, New Mexico 87002. 50¢.

P. R. Sharp, 104 N. Chapel Ave., #3, Alhambra, California 91801.

Southwest Cactus Co., Box 851, Alpine, Texas 79830.

Dick Wright, 11011 Tarawa Dr., Los Alamitos, California 90720.

General Range of House Plants

W. Atlee Burpee Co., Philadelphia, Pennsylvania 19132.

Edelweiss Gardens, 54 Robbinsville—Allentown Rd., Robbinsville, New Jersey 08691. 35¢.

Greenland Flower Shop, Rte. 1 (Stormstown), Port Matilda, Pennsylvania 16870.

House Plant Corner, Box 810, Oxford, Maryland 21654. 20¢.

Kartuz Greenhouses, 92 Chestnut St., Wilmington, Massachusetts 01887. 50¢. Gesneriads a specialty.

Logee's Greenhouses, Danielson, Connecticut 06239. 50¢. Wide range. Specialties: begonias, ferns, geraniums.

Merry Gardens, Camden, Maine 04843. Price list 25¢, pictorial catalog $1. Begonias, geraniums, among others.

Roehrs Exotic Nurseries, RFD 2, Box 144, Farmingdale, New Jersey 07727.

Geraniums

Carobil Farm & Greenhouses, Church Rd., RD #1, Brunswick, Maine 04011. Fuchsias, too.

Cook's Geranium Nursery, 712 North Grand, Lyons, Kansas 67554. 25¢.

Wilson Brothers, Roachdale, Indiana 46172. Other house plants, too.

See other listings for additional sources of geraniums.

Miscellaneous

Arthur Eames Allgrove, 281 Woburn St., North Wilmington, Massachusetts 01887. 50¢. Terrarium plants and supplies.

John Brudy's Rare Plant House, Box 84, Cocoa Beach, Florida 32931. 50¢. Seeds of tropical trees.

The Garden Spot, 4032 Rosewood Dr., Columbia, South Carolina 29205. English ivy cuttings.

International Growers Exchange, Box 397, Farmington, Michigan 48024. $2.00. Uncommon bulbs, orchids, too.

L.A.T. Designs, 504 S. Oak Park, Oak Park, Illinois 60302. Terrariums.

George W. Park Seed Co., Greenwood, South Carolina 29646. Indoor gardening supplies as well as plants and seeds of house plants.

Riekes Crisa Corporation, 1818 Leavenworth, Omaha, Nebraska 68102. Terrariums.

Talnadge Fern Gardens, 354 "G" St., Chula Vista, California 92010. 25¢. Also begonias, bromeliads and Christmas cactus.

Visual Design Manufacturing Company, 6335 Skyline Drive, Houston, Texas 77027. Terrariums.

HOUSE PLANT SOCIETIES

THE serious house plant buff who has developed a special fondness for a particular group of plants ultimately turns to the plant societies for detailed information. Membership dues vary, but all of the societies publish regular journals or newsletters. Some of them also have local chapters, about which you might wish to inquire from the national society. If you would like to join such an organization, here is a list of useful addresses:

African Violet Society of America, Box 1326, Knoxville, Tennessee 37901.
American Begonia Society, 1431 Coronado Terrace, Los Angeles, California 90026.
The American Gesneria Society, Mr. Edgar Sherer, 11983 Darlington Ave., Los Angeles, California 90049.
The American Gloxinia and Gesneriad Society, Mrs. Diantha B. Buell, Secretary, Eastford, Connecticut 06242.
The American Orchid Society, Botanical Museum of Harvard University, Cambridge, Massachusetts 02138.
Bromeliad Society, Mrs. Jeanne Woodbury, 1811 Edgecliffe Dr., Los Angeles, California 90026.
Cactus and Succulent Society of America, Box 167, Reseda, California 91335.
New York Cactus and Succulent Society, Mr. Lester G. Rothstein, 5 Grace Court North, Great Neck, N.Y. 11021.
New Jersey Cactus and Succulent Society, Mrs. Miriam Ritzfield, 150 Belmont St., Englewood, New Jersey 07631.
The Greater New York Orchid Society, Mrs. Anthony DeBetta, 116-31 Parkway Dr., Elmont, New York 11003.
The Indoor Light Gardening Society of America, Mrs. Fred D. Peden, 4 Wildwood Rd., Greenville, South Carolina 29607.
International Geranium Society, 1413 Shoreline Dr., Santa Barbara, California 93105.
Saintpaulia International, Box 10604, Knoxville, Tennessee 37919. ◆

An Encyclopedia for Indoor Plant Growers

MOST professional growers of indoor plants are familiar with Alfred Byrd Graf's monumental labor of love, *Exotica 3,* but a more concise tome by this author is now available for house plant enthusiasts, greenhouse hobbyists and admirers of "tropicalia." It is *Exotic Plant Manual.* Especially useful for identification purposes because of its 4,200 photographs (170 in color), Mr. Graf's 840-page manual also has a very precise code to culture. All sorts of plants are described, including begonias and gesneriads, carnivorous and gift plants, bulbs and, of course, succulents. There is even a provocative section on artificial plants, as well as down-to-earth articles on plant selection and care by Mr. Graf, who is one of horticulture's most extensive travelers. *Exotic Plant Manual* is available from the Roehrs Company, East Rutherford, New Jersey 07073. Price: $32.50
—*Marie Giasi*

THE WORLD'S BEST ILLUSTRATED GARDEN AND HORTICULTURAL HANDBOOKS

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how to use basic rules of color and design, making attractive containers, dried flower pictures, Christmas and other decorations

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kinds of soil; how to improve and maintain

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culture and use of hollies, rhododendrons, camellias, and other broad-leaved evergreens

23. **Mulches** $1.25
best kinds to use in various regions, when and how to apply, new materials available

24. **Propagation** $1.25
seeds, cuttings, layering, grafting; hormones, mist propagation

25. **100 Finest Trees and Shrubs** $1.25
descriptions; culture, hardiness, landscaping

26. **Gardening in Containers** $1.25
on roofs, terraces, difficult sites; city gardens; honging baskets, window boxes

27. **Handbook on Herbs** $1.25
basic kinds, culture, uses; well illustrated

28. **Pruning Handbook** $1.25
methods and effects of pruning woody ornamentals, fruits and many tender plants

29. **Handbook on Gardening** $1.25
everything for beginning gardeners, experienced gardeners, too; how to select and care for plants; scores of "how-to" pictures

31. **Bulbs** $1.25
when and how to plant all kinds of bulbs; best uses in the garden; indoor forcing

33. **Gardens of Western Europe** $1.25
a copiously illustrated traveler's aid

34. **Biological Control of Plants Pests** $1.25
by parasites, predators, other natural means

36. **Trained and Sculptured Plants** $1.25
special methods, pruning; many pictures

37. **Japanese Gardens and Miniature Landscapes** $1.25
old and new gardens and how they apply to Western horticulture

38. **Gardening with Native Plants** $1.25
how to know and grow American wildflowers
Same, cloth bound, hard cover $2.50

39. **The Environment: A Handbook of Ideas on Conservation for Every Man** $1.25
how to embark on anti-pollution and other projects in communities; short, constructive solutions for today's ecological problems

40. **House Plants** $1.25
superior kinds, uses, care; well illustrated

41. **Flowering Trees** $1.25
crab-apples, dogwoods, magnolias, cherries, others; how to select and grow them

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use, care and bloom succession of 200 kinds; selections for different parts of the U. S.

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walks and paths, fences, walls, paved terraces, steps, garden pools, benches

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a handbook on dyes derived from plants; how to use them for dyeing yarns and textiles; many recipes; 4 pages in color
Same, cloth bound, hard cover $2.50

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culture and uses of dwarf evergreens; 800 garden varieties described, 60 illustrated

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49. **Creative Ideas in Garden Design** $1.25
83 fine photographs of well-designed gardens for outdoor living and for viewing

51. **Bonsai: Special Techniques** $1.25
classic styles; ways to prune and wire; winter care; soil; 8 pages in color

52. **Handbook on Weed Control** $1.25
an end to crabgrass, other lawn pests, weeds in flower beds and in vegetable gardens; herbicides; picture dictionary of weeds

53. **African-Violets and Relatives** $1.25
gloxinias, episcias, columneas, too; miniatures; care, propagation; picture dictionary

54. **Handbook on Orchids** $1.25

55. **America's Garden Heritage** $1.25
explorers, plantsmen and gardens of yesterday. Origins of American Horticulture

56. **Summer Flowers for Continuing Bloom** $1.25
choice annuals, perennials, shrubs and trees; vacation gardening; container plants

57. **Japanese Herbs and Their Uses** $1.25
picture dictionary of uncommon kinds; recipes from Japan; flower arrangements with herbs

58. **Miniature Gardens** $1.25
diminutive landscapes and tiny plants; sink, trough and portable rock gardens

59. **Ferns** $1.50
kinds, care and uses; 4 pages of color

60. **Handbook on Conifers** $1.50
choice evergreen trees for year-round beauty

61. **Gardening in the Shade** $1.50
ground covers, broad-leaved evergreens, annuals, perennials, bulbs and vines; foliage plants for difficult sites; shade factors

62. **Gardening under Artificial Light** $1.50
ideas for basement gardening; common questions and answers; how plants respond to light; growing tips; buyers' aid

63. **1200 Trees and Shrubs— Where to Buy Them** $1.50
a uniquely useful buyer's guide, with brief descriptions of every plant; indexed for common and scientific names. Addresses of nurseries

64. **American Gardens—Traveler's Guide** $1.50
information on more than 200 gardens in the U.S. and Canada; travel directions, numerous photographs

65. **Plant Forms in the Landscape** $1.50
how to plant trees and shrubs to bring out their best qualities; an idea book compiled by landscape architects

66. **Rhododendrons and Their Relatives** $1.50
a beautifully illustrated guide to different kinds. Best choices for various parts of the U.S. Azaleas, heather, mountain-laurel and many others. Growing, propagating and buying tips

67. **Fruit Trees and Shrubs** $1.50
the best varieties of fruits and nuts for utility and beauty; how to grow and spray

68. **Herbs and Their Ornamental Uses** $1.50
The most attractive herbs for garden and kitchen use. How to design the small garden; knot and fragrance gardens, old rose varieties. A companion Handbook to #27

69. **Vegetables** $1.50
Available September 1972

70. **House Plant Primer** $1.50
Available December 1972

Order by name and number. Make checks payable to Brooklyn Botanic Garden
1000 Washington Avenue, Brooklyn, New York 11225

BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

The
Year's Highlights
in
Gardening
and
Horticulture

Guide to
Recent
Nontechnical
Books and Articles
for Gardeners

WINTER
1972-73

NEW SERIES
OL. 28 No. 4

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CONTENTS

Southern Magnolia (*Magnolia grandiflora*) .... *Louis Buhle* Cover
Among Our Contributors .... Inside Front Cover
Weeping Atlas Cedar (*Cedrus atlantica* 'Pendula') .... *T. J. Walsh* 2
Letter from the Brooklyn Botanic Garden 3
Green is the Color of Hope .... *American Horticulturist* 4
Root Hardiness of Woody Ornamentals .... *Horticulture* 7
X-ray Diagnosis of Trees .... *Arborist's News* 8
Plants Without Mothers .... *La Recherche* 9
A New Method of Hybridization .... *Proceedings National Academy of Science* 13
Nursery Sources for Ferns .... *American Fern Journal* 14
The Fancy Foliage of the Indoor Fern .... *The New York Times* 16
Growing Beautiful House Plants from Seed .... *Natural Gardening* 20
Fireplace Gardening .... *Garden Club of America Bulletin* 22
An Attractive Foliage Plant .... *George Kalmbacher* 23
House Plants in Alaska .... *Mary-Elizabeth Lee* 24
The New Mobility .... *Teatown Trails* 27
Gypsy Moth Control .... *Arborist's News* 29
Lethal Yellowing Disease Breakthrough in Jamaica .... *Journal of the Agricultural Society of Trinidad and Tobago* 30
Through the Years with Mister Buhle 31
The Alpine House .... *Plants Alive* 35
Informal Paving for Easier Gardening .... *Journal of the Royal Horticultural Society* 39
Southern-style Victuals .... *Flower and Garden* 42
Osage-orange .... *Joseph C. McDaniel* 45
Ornamental Grasses .... *Mary Hockenberry* 46
A Simple Frame for Softwood Propagation .... *Arnoldia* 49
Mycoplasmas .... *Grounds Maintenance* 52
Lemon-verbena .... *Elizabeth Remsen Van Brunt* 56
What About the Organic Way? .... *The New York Times* 58
Florida Palm Scourge .... *American Nurseryman* 60
1972 Books Worth Noting 61
Index to Volume 28 (1972) 64

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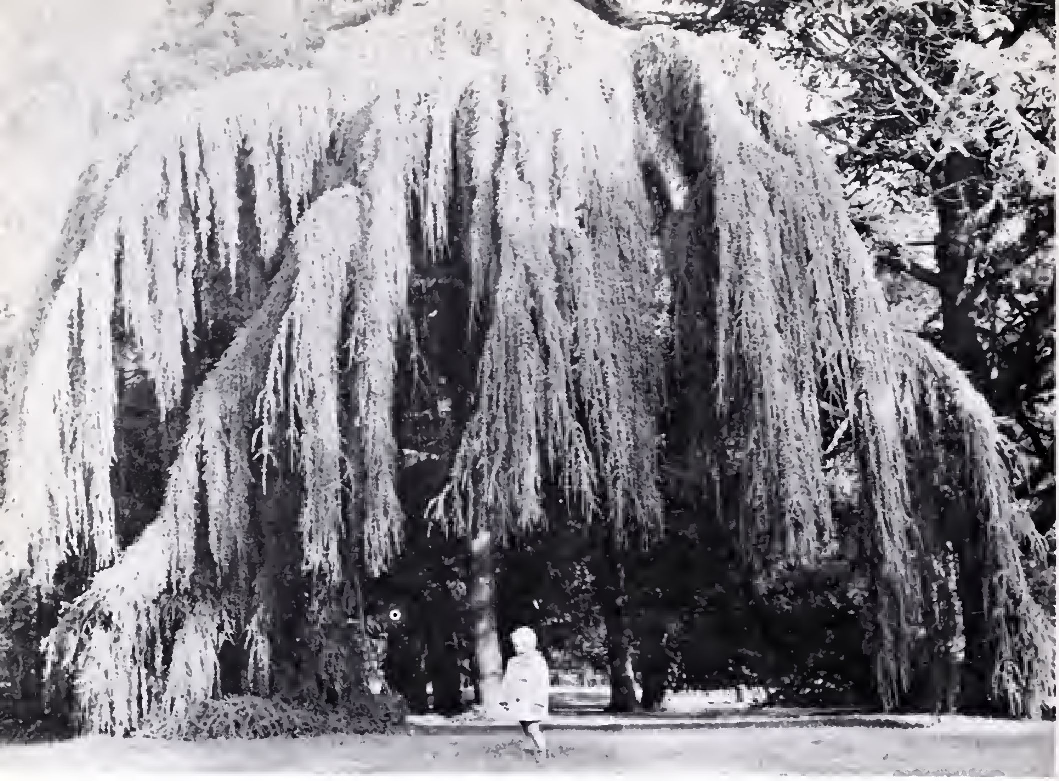
Copies of special issues of PLANTS & GARDENS are available as Handbooks.
For a list of topics see back cover.



T. J. Walsh

Trees with pendulous branches are true aristocrats of the plant world, and the weeping Atlas cedar *(Cedrus atlantica pendula)* growing in the National Botanic Garden (Glasnevin), Dublin, Ireland is one of the finest of all. Planted about 1875 and staked for the first 20 years of its life, it is now about 23 feet tall and 32 feet wide. Specimens vary in needle color, the Glasnevin tree being silvery, while one planted about the same time in the Jardin de Meyrin, Geneva, Switzerland, has bright green foliage. Both types are found in the American nursery trade, although they are not always described as such. If not as winter hardy as the Sargent hemlock, a better-known conifer also with pendulous growth habit, the weeping Atlas cedar can be grown at least as far north as the area of New York City. On the West Coast, where winters are relatively mild, it is sometimes encountered as far north as Victoria, British Columbia. Growing tips: This evergreen requires good drainage and full or nearly full sun. Select a specmen location for best effect but make sure it is not subject to strong winter winds. Stake the tree while young, otherwise it will just sprawl along the ground. Young trees are more odd than graceful, but if the above photograph is any indication, patience will bring its reward.

LETTER FROM THE BROOKLYN BOTANIC GARDEN

It is a keen pleasure to report the confirmation of new leadership at the Botanic Garden. On January 1, 1973 Mrs. Franklin B. Tuttle, Chairman of the Governing Committee, announced the appointment of Elizabeth Scholtz as Director. Miss Scholtz, who served as Acting Director for a year, and before that as head of the adult instruction program, has the best wishes of all good friends of the Garden in her new position. Note to new readers: An extensive interview with Miss Scholtz appeared in last year's winter issue.

As another gardening season begins, it is appropriate to look back upon the past year and present readers with an anthology of some of the most noteworthy articles that appeared in other periodicals in that time. This "digest" issue also includes several original articles selected for timeliness or special appeal. To all Contributors, as well as to the publications that have given the Botanic Garden permission to reprint various articles, we extend a very warm word of thanks.

As time goes on, some of the older Handbooks in the Brooklyn series, while surprisingly durable, become a bit shopworn and must be updated or, in a few cases, completely revised. Eight of them underwent an updating process in 1972 and several others have been temporarily withdrawn from the shelf. Most of the changes were routine, but attention should be directed to the new edition of GARDEN PESTS (Handbook No. 50), the revision of which was supervised by the original guest editors, Cynthia Westcott and Jerry T. Walker. Because of rapidly changing pesticide regulations in recent years, this 1965 issue required a major face-lifting. Copies of the revised edition are available for $1.25 each.

In the course of a year the Botanic Garden receives many letters from P & G readers. One suggestion occasionally made is that the "digest" format of the winter issue be dropped in favor of an additional special-feature subject. This would enable us to give readers, at no extra charge, timely revisions of important titles such as GARDEN PESTS. However, we look upon the idea with askance since it might also prevent the appearance of various articles that, because of their particular subject matter, do not lend themselves to use in a special-feature Handbook. If you have strong feelings pro or con, please drop us a line.

Another reader suggestion is that a future special-feature issue be devoted to selected contributions from members. While the mechanics of this would have to be carefully explored to avoid duplication, the idea sounds attractive at the moment, because there is obviously a wealth of practical how-to knowledge on the part of members that could—and should—be shared with gardeners everywhere. The logical Handbook for such a treatment is GARDENING IN CONTAINERS, which will be completely revised in a year or so.

As a preliminary measure, if you are interested in participating, please write and tell us about some aspect of container-growing in which you have had special experience. Kindly do not submit any contributions for consideration at this time, but take a moment to look over the original issue (Handbook No. 26, Spring, 1958) for ideas on possible subjects. Also, bear in mind that good black and white photographs and perhaps a few step-by-step drawings of unusual but easy-to-make containers would enhance the appeal of such an issue.

Finally, depending on the harvest this summer, there will be a seed dividend of yellow-wood *(Cladrastis lutea)* for interested members. Fragrant, white, wisteria-like flowers in late spring and smooth gray bark are the chief ornamental traits of this medium-sized tree. It is hardy in all but the very coldest parts of the United States. Please send a stamped, self-addressed envelope to me if you would like to grow some seed.

May your garden be especially bountiful this year.

Frederick McGourty, Jr.

Editor

In the seeds that we planted last week or the cuttings we shall make next week lies our hope for survival

GREEN IS THE COLOR OF HOPE

Henry M. Cathey

From American Horticulturist, Fall 1972

By tradition, the horticulturist has planted seed, taken cuttings, and grown and protected plants for food, utility and beauty.

Today, his job is bigger than the tradition. The environmental crisis is growing more threatening every day. The horticulturist can help meet that crisis. He can put greater horticultural knowledge and experience into man's efforts to improve the world he lives in. The world needs all of his techniques and skills to develop plants to survive in a changing environment, plants to meet changing life styles, and plants to fit the shrinking limits of available time and space.

What the world needs now is smog-resistant trees and shrubs, including plants for compact and often hostile areas.

Today's horticulturists are prepared for this role with their special knowledge of plants genetics, physiology, and pathology. Already they have made great advances. They have increased productivity, and bred pest and disease resistance into many horticultural lines. They have given us new ornamentals. They have learned how to induce plants to bloom on schedule so that florists can offer spring-flowering plants with the popular poinsettia at Christmas time and chrysanthemums the year round.

They have accommodated their work to new developments in other fields. For instance, they have adapted the fragile tomato, as well as other fruits and vegetables, to mechanical harvesters. They grow orchids in Hawaii and carnations in Colorado to take advantage of favorable growing conditions; then they use improved storage and transportation to get their products to market quickly.

To accomplish so much, horticulturists have had to overcome incompatibility of seed plants; eliminate disease reservoirs of stock plants, utilize artificial soil mixes and fertilizers; and become manipulators of plant growth through the use of light, temperature and special growth substances.

While the horticulturist is seeking to improve our fruits, vegetables, and ornamentals, the rest of us are indirectly working against him. The public is taking out of production some of the best land for horticultural use. We are saturating our surroundings with machines, concrete, buildings, and with a rapidly developing excess of people.

Our planet contains a number of limited consumables. The major limiting consumable may be readily available carbon dioxide. To maintain the present level of photosynthesis on earth, we must recycle all of the CO_2 every 250 years. But this rate is being accelerated. Increased population and increased mechanization have caused our global society to tie up oxygen and to release CO_2 faster than in any previous generation. We are slowly changing the balance of life on earth. Furthermore, at this point in history, we do not know the long-term effects—on a global scale—of increased CO_2 levels, increased growth rates of plants, changes in temperatures in our urban areas, and the shift in the balance of nature.

We do know this: Photosynthesis is essential to life. And we know that:

1. Almost three-fourths of all photosynthesis occurs in water—in algae—so that most of our oxygen supply comes from tropical oceans.
2. Cultivated plants probably contribute less than ten percent of the total photosynthesis.
3. Photosynthesis occurs only at a specific range of temperature, relative humidity, mineral nutrition, and so on.
4. Plant release of CO_2 occurs only in sunlight. Thus, during part of each day (night), and part of each year (winter), plants do not add O_2 but actually remove it from the atmosphere.
5. The level of photosynthesis depends on light intensity and the CO_2 level. CO_2 is usually a limiting growth factor.

On the average day our environment contains 0.03 per cent CO_2. There are many intervals, during the daylight hours, when the level of CO_2 falls greatly, depending on the kind of plants and on other environmental factors.

Nevertheless, plants have a unique function in the recycling process. They recycle CO_2 and O_2, complementing the cycling of animal metabolism. However, plants contribute to the recycling system *only* when they are in active growth, with all of their green leaves carrying on photosynthesis.

The plot of grass in one's garden is not related to any specific group of people, as implied by the claim that fifty square feet of grass liberates enough oxygen to serve a family of four. Such claims are based on classic information from textbooks plus a slide-rule expansion to 365 days a year. Most plants grow in marginal circumstances. Since they give off O_2 only under the specific conditions described above they are efficient in the range of 3, 5, or 7 per cent of the classic ideal; routine slide-rule expansion is misleading.

Although plants cultivated by man contribute only a small percentage of the total photosynthesis on earth, these green plants are important to us because they live where we live. These green plants surround man, and help him and his habitat create the landscapes of earth.

The ability of plants to play their role in photosynthesis depends on the kind of plant and on light. Plants vary greatly in the minimum-maximum range of light levels they require to support their growth. For instance, beans need a minimum of 100-foot candles. Oaks can live in a range from 300- to 1,500-foot candles, pines from 300- to 9,000, and philodendron from a minimum of 25- to a maximum of only 500-foot candles.

Scattered remains of rubbish, floating in our air, filter out some light and retard the recycling of CO_2 and O_2. We are told that plants in our urban environment today are receiving sixteen per cent less light than they did a generation ago. This means that the efficiency of city plants is reduced, since they may be growing at a minimum or lower than the maximum light levels.

In the interest of improving our environment with plants, some mistakes have emanated from well-meaning but misguided assumptions and slogans. Let us consider a few, and also the positive approach that can be made.

"We should plant a tree." This is good advice in the right place. Ask the men and women who know—the horticulturists. Look to them and get involved in sensible gardening and sensible planting. There are organizations to suit all tastes; work with the ones that best suit you.

"Plants purify the air." This in itself is an oversimplification and can be misleading. Plants suffer in polluted air filled with chemicals that attack the life-support system of plants. These chemicals are by-products—wastes—of man's machines. Some may even be created in space by photochemistry. During the daylight hours, plants have their "mouths," or stomates, wide open. They take up ozone, sulfur dioxide, peroxylacetyl nitrate (PAN), carbon monoxide, ethylene, and other harmful substances. Plants may not be fully effective in ridding the environment of these, but they do trap and remove from the air much that is a threat and even potentially lethal.

Plants also help to recycle water. Man

Marjorie J. Dietz

While many plants are extinct today, relicts such as the ginkgo have survived.

rejects water that is not palatable. Plants are just as demanding of good quality in water. Some of the materials dispersed and dissolved in water reduce its availability to plants, and thus limit plant growth.

The amount of water required by even one annual plant is enormous. For example, in one growing season a single tomato plant requires thirty-four gallons, one corn plant fifty-four gallons, and one sunflower plant as much as 130 gallons.

Of the total water required for each plant, less than five per cent is used directly to maintain its life processes. Plants lose water to the atmosphere as part of the recycling of the earth's "consumables." The remaining ninety-five per cent of the required water cools the surrounding areas and sets up the recycling from contaminated to aerated rain water.

Plants can serve man in another area of "pollution"—noise. Man and his machines generate a steadily rising din. Over the years, noise levels have increased to the point where they are producing both psychological and physiological problems for us. Green plants can be used in strips, buffers, and screens to deflect, absorb, break up, and muffle many of the sounds that make community living unpleasant and uncomfortable.

Light upsets nature's balance. Man's need to see—to see movement of other men and machines after dark—has brought "moonlight" during the night hours over most of our urban environment. Ordinary mercury vapor lamps have been the standard urban lighting for many years. Although they have only slight effect on the growth and development of our green plants, the blue light emitted from them attracts night-flying insects from surrounding areas. The insects consume decorative plants, lay eggs for future generations, and disfigure the landscape.

To prevent this kind of pollution, many of our cities now are substituting so-called "color-improved" lamps for the blue ones. These are not the answer, either. They emit enough red light to cause the green leaves of many kinds of plants to hold on and delay the necessary onset of dormancy. Yellow lights generally are better because the red is at such a low level as to have little or no effect on plant growth. Night lighting with the wrong kind of lamps can greatly decrease the survival potential of some of our most desired trees and shrubs.

"Man will continue to find ways to adapt himself and his plants." This is an optimistic view. Man may be able to do some things to adapt himself, his plants, and his environment, to survive. Many plants are extinct today because they were not able to survive. Others such as the magnolia, dogwood, and the ginkgo, have survived many environmental changes and still are beautiful and widely used.

In this adaptation process Man can call upon all of his resources. But he must still look to the horticulturist to propagate, to grow, and to protect our plants.

Green is the color of hope. In the green of our plants is the hope of survival. It begins in the hands of the skilled horticulturist but ultimately it moves through the hands of horticulturists to the hands of all people who grow plants—fruit, vegetables, ornamentals. ◆

ROOT HARDINESS OF WOODY ORNAMENTALS

Grown in containers in nurseries or in planters

John R. Havis

From HORTICULTURE, November 1972

ROOT HARDINESS is usually of little concern when nursery plants are grown in the field and landscape plantings are set into the ground. Even when the soil freezes in winter the temperature in the root zone seldom goes below 30° Fahrenheit. The soil may even remain unfrozen in severe winters under several inches of snow or organic mulch.

The problem of root hardiness of ornamental plants becomes important, however, when plants are grown in containers in nurseries or when above-ground planters are used in landscaping. Roots in such exposed containers may reach 0°. Thus, it may seem unusual that roots do not develop cold hardiness at the same time nor to the same degree as the tops of the same plants. Nevertheless, we have found, for example, that *Ilex opaca* tops develop hardiness to about —20°, but their roots are killed at +20°. *Ilex crenata* roots also fail to become hardy below about +20°.

Magnolia soulangiana and *M. stellata* roots are even less hardy, usually being killed at about 25°. Fortunately, several plants develop more root hardiness than those mentioned above. Intermediate in root hardiness are such plants as *Cotoneaster horizontalis, Viburnum carlesii,* and *Pyracantha coccinea,* which are killed at between 18 and 15°. Another group, which includes several broadleaved evergreens, *Kalmia, Pieris* and *Rhododendron,* as well as such needled-evergreens as *Juniperus, Taxus* and *Pinus* are killed at about 10° in mid-winter.

Roots are basically different from tops in that they do not appear to have a true dormancy. The tops of most of our northern species stop growing in the autumn in response to short days. Thus, cold acclimation follows cessation of growth in response to short days and frost. Roots, on the other hand, continue to grow as long as the soil temperature is above about 40°. We have found that in Massachusetts container soil temperatures remain above 40° and roots continue to grow well into November, at which time the tops of *Cotoneaster horizontalis,* for example, were already hardy to well below 0°.

Plant parts cannot begin to develop cold hardiness until they stop active growth. Therefore, the continued fall growth of roots could partly account for the root hardiness problems. In any case, cold periods in November and December find roots especially vulnerable.

Much research on root hardiness must be done if above-ground planters in landscaping and nursery production are to be reliable in areas where extended freezing temperatures are common. Obviously, we need to learn the root hardiness of many more species than the few now known.

Most of the limited research to date has been with young plants but it is possible that the roots of older plants, those of landscape size, may be more hardy. Perhaps, too, older roots are hardier than young roots. If this be true, we need to know the cold tolerance of the older roots as well and also whether plants in the landscape can survive and grow satisfactorily if the young feeder roots are killed each winter but the larger ones not. Further information is needed on possible ways of protecting the roots of landscape plants in above-ground planters. Built-in insulation and electric heating cables might be of practical benefit. Economical and dependable methods for the protection of roots in nursery containers are needed to enable growers to provide a reliable supply of high-quality plants. A practical method of inducing significantly more hardiness in roots would be of great benefit to both nurseries and landscaping.

The adjustment of nutrient levels in the plants has been considered and tested experimentally for increasing root hardiness. Although the level of nitrogen and the form of nitrogen (nitrate vs. ammonium) has not affected root hardiness, the application of potash to potassium-starved plants has improved hardiness. However, an excess of potash above that required for normal growth has not been beneficial. Excesses of other nutrients have similarly not increased hardiness. We must conclude, therefore, that balanced fertilizing for healthy growth is most favorable for cold hardiness of roots as well as tops.

The moisture supply is also important in above-ground containers. Water releases heat when changing from liquid to ice at 32°. For this reason a long period is required to freeze wet soil, whereas a dry one drops below freezing quickly during cold periods. Keeping a high moisture level in the soil of planters and containers helps to prevent dangerously low root temperatures during short cold periods. However, extended cold periods eventually freeze wet soils and after freezing, the soil temperature approaches that of the air but, other than slowing the rate of freezing of the soil, moisture does not protect roots from cold injury. ◆

X-Ray Diagnosis of Trees

X-RAYS help diagnose human illness. X-rays may soon be equally indispensable in diagnosing the internal condition of trees. Because defects and decay in wood have different densities from healthy wood, forestry scientists have found it possible to make radiographic photographs with good contrast and detail by passing X-rays through a tree onto film. With radiographs for viewing, foresters will no longer have to cut and dissect a tree to get disease and defect information; nor will they have to rely on an inaccurate system of predicting internal problems by external indicators, such as branch stubs and insect entry holes.

The possibility of penetrating trees with X-rays was established by scientists more than 40 years ago. Yet the process was never adopted by foresters because of a lack of practical equipment. Until now, the only X-ray units at their disposal have been the cumbersome and stationary medical types, impossible to use in the field.

Because of the problem, Forest Service Plant Pathologist Frederick H. Berry and Research Technician John A. Beaton of the Northeastern Forest Experiment Station, and Entomologist William B. White of the Northeastern Area, State and Private Forest Pest Control Unit in Delaware, Ohio, instigated development of a mobile field X-ray unit mounted on an all-terrain vehicle, to meet their specifications.

According to the Forest Service researchers, this mobile field X-ray unit holds promise of helping tree pathologists and entomologists diagnose the extent of decay and defect in a tree. It offers many other possible benefits. For example, with this unit scientists could reexamine test trees at a later date; city arborists could determine whether trees along their streets and in recreation areas are safe; shade tree companies would be able to decide if homeowners' trees are sound or in need of surgery.—*ARBORIST'S NEWS*, May, 1972.

PLANTS WITHOUT MOTHERS

Jean-Paul Nitsch

Translated and condensed from LA RECHERCHE (France), June 1971

A NUMBER of research centers, scattered through many countries, are striving to obtain new varieties of plants—varieties more floriferous or with better foliage color for ornamental plants; varieties with greater nutritional value in the case of food plants; or ones that are more resistant to certain diseases, better adapted for a particular climate, or having a greater yield. All of these modifications are the result of transformations in the hereditary constitution of the plant, brought about by hybridization or by mutation. Although certain mutations appear spontaneously, the scientist now seeks to experimentally invoke a large number of them by means of gene-changing agents, such as radiation and certain chemicals.

Unfortunately, these mutations, although incorporated in the hereditary make-up of a particular plant, are not inherited by all of the individual plants descending from it. The problem consists of how to obtain, apart from the original plant that has undergone mutation, offspring where the new characteristics occur in a constant manner in all of the descendants. It is in this stabilized condition that the offspring, called pure, can be put to work for agricultural purposes. The utilization of haploid plants ought to permit a positive and easy way to obtain this goal.

How are Genetically Pure Offspring Obtained?

Among the cells which make up the greater part of higher organisms, only the gametes (sex cells) contain the *n* number of chromosomes. These are called haploid cells. All other cells making up the body of an animal or plant are called somatic cells. They contain the *2 n* number of chromosomes—that is, two times as many, resulting from the fusion of egg and sperm. They are said to be diploid.

Pure diploid offspring can only be obtained from homozygous subjects, namely those in which the hereditary material exists in the form of two *identical* sets of chromosomes in each cell.

In most cases these two sets involve some differences, one set having come from one parent (through the sperm), the other from the other parent (through the egg). Such an organism is called heterozygous. A dominance can establish itself among the two lots of inherited characteristics, in a way that a characteristic carried by one of the parents is not seen in the hybrid of the first generation offspring. Such characteristics are called *recessive* (genes). When a certain characteristic of the other parent appears in the offspring we refer to it as *dominant.* A change taking place in the hereditary material of a heterozygous (diploid) organism, if it affects a recessive gene, can be observed: a) only in certain descendants, or b) if a mutated plant has been self-fertilized, it may appear in offspring after the second generation following the mutation.

By contrast, a change in the hereditary material of haploid organisms, a mutation for example, manifests itself immediately by a new characteristic. One has only to bring about the doubling of chromosomes in this new variety. It is possible to obtain in this manner, in a solitary operation, homozygous diploid individuals where every gene is in double state, that is, a genetically pure plant.

Haploid plants are interesting for another reason. When one crosses two homozygous progeny, one obtains plants of which the vigor is not intermediate be-

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See also "Plant Tissue Culture—and Plant Breeding" in PLANTS & GARDENS, Winter 1971-72, pages 20-24.

tween the parents, but greater. The success accorded the well-known corn hybrids ("hybrid vigor") is a good example of this.

At the present time, the procedure to obtain homozygous offspring from a plant one is working with is to pollinate the plant with its own pollen, carefully guarding against the intrusion of foreign pollen carried by the wind or by insects. Self-pollination (and therefore self-fertilization) should be repeated over ten-or-so successive generations in order to finally obtain offspring that are practically homozygous for certain characteristics (all nonconforming offspring are eliminated). Of course, much work and time—sometimes ten years—are necessary to obtain pure offspring for plants used in agriculture.

Also, plant breeders have for a number of years sought to obtain haploid subjects for all cultivated plants. Unfortunately, these subjects are rare. One of the techniques most frequently used—the search for seeds having twin embryos (one of the twins is occasionally haploid)—often results in the discovery of only one haploid embryo for 10,000 seeds! For the last ten years, however, it is by this method, followed by a doubling of chromosomes with a chemical substance (colchicine) that the corn hybrids grown on today's farms have originated.

Such a method is cumbersome, and other ways have been sought to experimentally obtain haploid plants. The technique generally employed up to now consists of bringing about parthenogenesis, that is, the further development of the female gamete (egg cell) without fertilization. One can start this process in motion either by crossing distantly related species or by utilizing pollen (the male element) irradiated by x-rays or gamma rays. In neither case is the pollen capable of fertilizing the egg cell, that is, uniting with it, but it stimulates the division of the female haploid nucleus and its development into an embryo. The percentage of success generally is very small.

Fortunately, a new method has just been developed, one based upon the production of plants directly from pollen. It will probably cause the preceding methods, which are uncertain at best, to fall into disuse.

Embryos Without Mothers

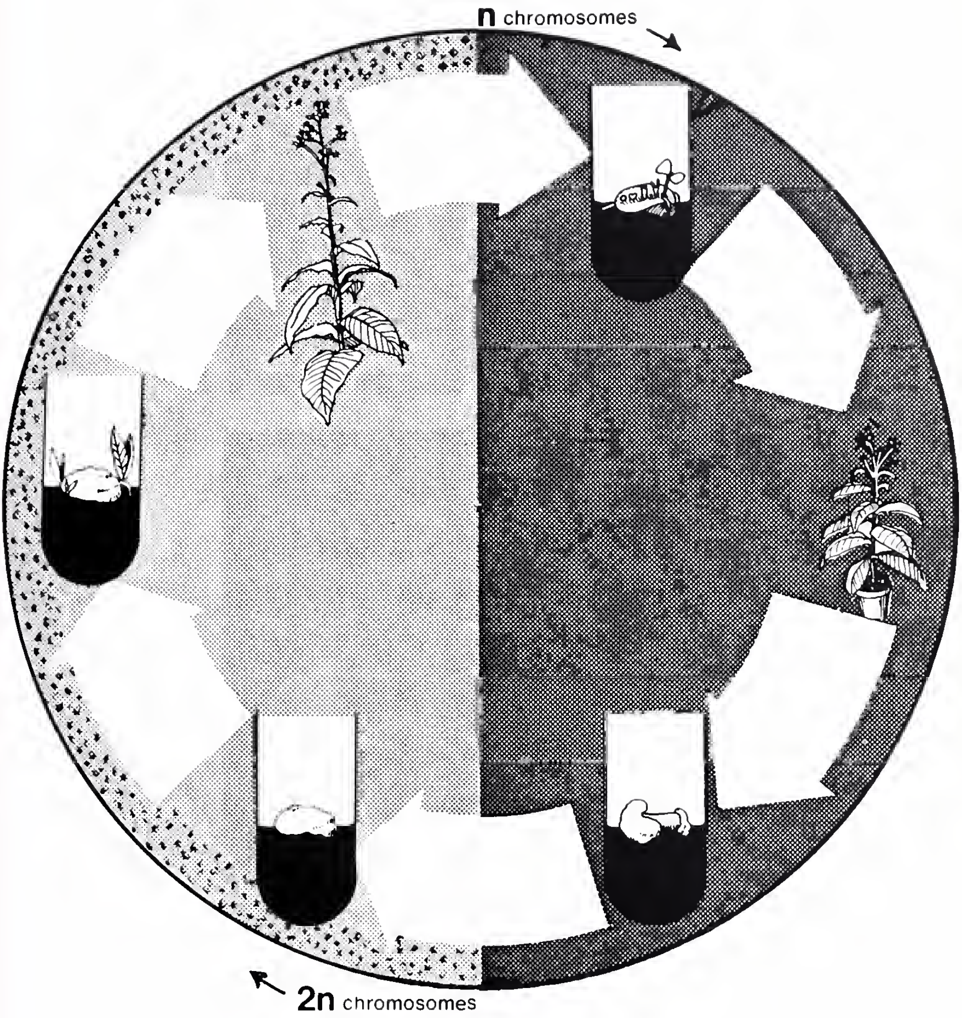
During the development of a flower, a certain lapse of time occurs between the moment the haploid cells of the male system (pollen) are produced and their fusion with the female element (egg cell). Pollen develops in the other, where the pollen mother cells undergo reduction-division—which means that each pollen 'mother' cell divides into four 'daughter' cells, and during the process the number of chromosomes is diminished by half. The four daughter cells, called microspores, are haploid, that is, they contain the n number of chromosomes.

The microspores occur in great numbers (40,000 in tobacco) in the pollen sacs of the anther, the anther being the bag-like end of the stamen. Each microspore is thus a one-celled haploid element. Normally, the nucleus in each microspore divides and this results in a multicellular structure. One of the cells is a sperm cell, and at this stage it has become a pollen grain.

By cultivating these microspores (in the interior of an anther which has been placed on a nutritive-growing medium), their repeated division is facilitated. They then give rise to some small cellular masses. Eventually, the walls of the pollen grains break open and these masses develop in an unexpected manner: they become transformed into embryos!

Historically, the first success in this field of research was obtained with plants of *Datura* (a tomato relative from which certain alkaloids used in pharmaceuticals are extracted), by two researchers at the University of Delhi (India), S. Guha and S.C. Maheshwari. In 1964 these men observed that the anthers of *Datura innoxia*, grown in cultural media currently used for diverse vegetative tissues, produce structures resembling embryos. Two years later, they demonstrated that the

(Continued)



In order to perpetuate a desirable mutation it is possible, under laboratory conditions, to obtain from haploid mutants the corresponding homozygous diploid mutant by doubling the number of chromosomes. On the inflorescence of a normal tobacco stalk (upper left), a bud at the correct stage of development is selected and its stamens are planted on a nutritive medium. The microspores produce haploid embryos. The plantlets thus obtained are pricked off into pots where they develop into plants with *n* chromosomes, which eventually flower. Fragments of stems or petioles on these haploid stalks are then planted on a medium favoring the development of callus. As the callus proliferates, the chromosome number doubles by endomitosis. The callus is then placed on a medium favorable to the formation of buds. The buds which spring from diploid cells produce tobacco stalks with 2 *n* chromosomes.

cells of these embryos contain only the haploid number of chromosomes. They concluded from this that the embryos would very likely spring forth from pollen grains.

There the matter rested until 1967, when J. P. Bourgin and this author published results obtained with other species, this time of the genus *Nicotiana*, tobacco (*N. tabacum*) and *N. sylvestris*. From stamens cultivated in vitro we succeeded in raising to the flowering stage numerous *Nicotiana* haploids belonging to these two species. This work has been followed up by many other researchers in France, also in Japan, England, Germany, Italy, the United States and other countries.

Numerous experiments with tobacco, which should lead to a better understanding of a suitable growing medium, show that the composition of the cultural medium has only a secondary importance for the proliferation of microspores. In fact, a 2 per cent solution of sugar is enough to set in motion the first stage of embryo development, the formation of cells which correspond well enough to the "globular stage" of the embryologists. In order for the development to be continued, however, it is necessary to add some iron and mineral salts. The role of iron, still unexplained, is a determinant. In its absence, development does not progress, even if the other mineral salts are present.

The development from the globular stage follows the normal stages of tobacco embryo development, just as it would occur in tobacco seeds. These embryos then germinate, which is to say they become capable of "making their own living." They form roots and green leaves.

At the end of about a month on the culture medium, numerous plantlets grow out from the pollen grains (which are still contained within the anthers). A count of the chromosomes in their cells indicates that these plantlets are haploid. More than a hundred embryos from a single anther of tobacco may be obtained. Raised in a greenhouse, the tobacco haploids produce plants which flower abundantly, but without producing any seed. They have the same flowering response to length of day as the plant from which they are derived. The flowers are about one-quarter smaller than those of the normal (diploid) plants, and the intensity of their color is weaker. Leaf and stem size are smaller than in diploid plants. The haploid plants, which are sterile, can be propagated only by cuttings.

A variation of the above method has been used in Japan to obtain hybrid plants of rice. By cultivating the anthers in a medium enriched with plant hormones, the pollen cells divide and grow into an unorganized mass of cells called callus. The mass, transferred to a medium where the auxin level is distinctly lower, gives birth to leafy shoots, some of which are haploid.

Once haploid plants are obtained, it is easy for scientists to produce mutants. The irradiation of young plantlets by gamma rays of radioactive cobalt-60 has given birth to a whole range of mutants. Unfortunately, although these mutations are numerous, they are uncontrolled, and most of them do not have any practical interest. If a modified trait seems worthy of being retained, the mutated plantlet will be carefully set aside, to be worked on further.

Haploid plants, mutated or not, are sterile. To make them fertile, it is necessary to bring about a doubling of chromosomes. In an experimental manner, this doubling can be obtained by making use of a substance like colchicine which hinders the separation of the chromosomes during cell division.

A Supplementary Step: Fusion of Protoplasts

If there is one thing that limits experimental gene-changing, it is that these mutations cannot be totally controlled. This is why we turn with much hope to another technique: the fusion of protoplasts.

In mixing cell cultures of different animals, it is possible to obtain tissues composed of cells of two different types, and even to come upon real somatic hybrids. But it has not been possible, until now, to attain such fusions in plant tissues. Plant cells, in fact, are enclosed in a rigid envelope formed of cellulose (the cell wall), a mechanical obstacle to cell fusion. To surmount this difficulty, it is necessary to free the cells from their cellulose walls by means of enzymes (pectinase and cellulase). Following the necessary steps, various laboratories have succeeded in obtaining without walls the living protoplasm contained in the plant cell. Once it is liberated from its envelope, this protoplasm takes the form of a sphere inside which the life processes continue to go on. It is thus a naked cell, the protoplast. It has been possible to induce division of such protoplasts and the regeneration of a new cellulose wall. Before this regeneration, the protoplasts can fuse among themselves or with the protoplasts of other species, tomato with potato, for example. One can hope to add to a protoplast emanating from one species the trait of another species of particular genetic interest. Henceforth, tobacco plants complete with stems, leaves and roots can be raised from protoplasts grown in a test tube.

A Look to the Future

The making of haploid plants, at least in species discussed here (tobacco and *Datura*), is easily realizable from pollen grains. In opening an anther of the stamen of a flower, there exists at one's command a hundred embryos which constitute choice material for the study of plant embryogenesis. This discipline, very much behind compared with animal embryogenesis, precisely because of the difficulty of obtaining free plant embryos, ought to progress rapidly with the utilization of haploid embryos.

Moreover, the interest in haploid plants in the selection of pure offspring is incontestable. In this regard, the technique of anther culture, which seems to be the most satisfactory for the production of such varieties, should become common practice. However, experimental methods must still be improved.

As a matter of fact, the results have been positive with four species of tobacco (*Nicotiana*), but six others have not yet led to the formation of embryos. With rice, we have seen that it is by the intermediary of haploid callus that it has been possible to obtain haploid plantlets. With wheat, only callus tissue has been obtained so far; it has not yet been possible to make plantlets grow from them. However, the technique has given positive results in various *Datura* species and in cabbage.

No doubt, by persevering, researchers (whose work in this field is just beginning) will extend the method. Beyond these certain consequences lies another hope, that of uniting by the fusion of protoplasts species that it has been impossible to cross so far. With these new opportunities, forged by patient research in the laboratory, plant genetics ought to make a big leap forward. ◆

A New Method of Hybridization

USING two species of tobacco (*Nicotiana glauca* and *N. langsdorfii*), large number of leaf cells were isolated and their cellulose walls were removed by enzymatic digestion. Many of these wall-less cells were then fused experimentally, and placed on a culture medium. The hybrid fusions thus produced were induced to form shoots and leaves. By grafting hybrid shoots on to *N. glauca*, mature fertile plants resembling sexually produced hybrids resulted.—Carlson *et al*, *Proceedings National Academy of Science*, Vol. 69, No. 8, pages 2292-2294, 1972.

NURSERY SOURCES FOR FERNS

Donald G. Huttleston

Adapted from American Fern Journal, January-March, 1972

All nurseries listed are retail mail-order firms unless otherwise indicated (W = wholesale only; W & R = wholesale and retail) and sell plants only, except those marked with S (spores only) or S & P (spores and plants). A few cash-and-carry nurseries (indicated by C & C) are included if they handle a number of unusual species. Numbers in the code refer to the total kinds of ferns listed by a particular nursery. The letter H signifies firms having species that may be expected to be hardy in cooler parts of the United States, while T refers to nurseries dealing primarily in mild-climate or tender ferns.

Fern Hill Farm, Rte. 3, Box 191, Greenville, Alabama 36037 (9H)

California Jungle Gardens, 11977 San Vincente Blvd., Los Angeles, California 90049 (18T)

El Modeno Gardens, 29140 East Chapman, P.O. Box 2212, El Modeno, California 92669 (W45T)

Mike Kashkin, Fuchsia Land, 4629 Centinela Avenue, Los Angeles, California 90066 (C&C70T)

Flora Greenhouses, Box 1191, Burlingame, California 94010 (21T)

Clyde Robin, P.O. Box 2091, Castro Valley, California 94546. Minimum order $1. Catalogue 50¢ (6T)

Carl Stephens, The Shop in the Sierra, Box 1, Midpines, California 95345 (1)

Talnadge's Fern Gardens, 354 G Street, Chula Vista, California 92010. Minimum order $5. Catalogue 25¢ (124T)

Wilson Orchids, 490 Beverly Avenue, San Leandro, California 94577 (9T)

Logee's Greenhouses, 55 North Street, Danielson, Connecticut 06239. Minimum order $6. Catalogue 50¢ (40T)

Ruth Hardy's Wildflower Nursery, Falls Village, Connecticut 06031. Catalogue 50¢ (26H)

White Flower Farm, Litchfield, Connecticut 06759. Minimum order $5. Catalogue $2.50 (9H)

Alberts & Merkel Bros., Inc., Boynton Beach, Florida 33435 (47T)

Fantastic Gardens, 9550 S.W. 67th Avenue, Miami, Florida 33156 (80T)

Lounsberry Gardens, P.O. Box 135, Oakford, Illinois 62673 (20H)

Henderson's Botanical Gardens, Route 6, Greensburg, Indiana 47240 (25H)

Tropical Paradise Greenhouse, 8825 W. 79th Street, Overland Park, Kansas 66204. Minimum order $10 (62T9H)

Arthur Eames Allgrove, North Wilmington, Massachusetts 01887. Catalogue 50¢ (8H)

Blackthorne Gardens, 48 Quincy Street, Holbrook, Massachusetts 02343. Catalogue $1 (23H)

Leslie's Wild Flower Nursery, 30 Summer Street, Methuen, Massachusetts 01844. Catalogue 25¢ (38H)

Bluemount Nurseries, Inc., Box 219, Rte. 2, Blue Mount Road, Monkton, Maryland 21111 (13H)

Merry Gardens, Camden, Maine 04843. Price list 25¢ (25T)

The Rock Garden, RFD #2, Litchfield, Maine 04350. Minimum order $3.50 (8H)

Rakestraw's Gardens, G-3094 South Term, Flint, Michigan 48507. Catalogue 25¢ (3T)

Ferndale Nursery & Greenhouses, Askov, Minnesota 55704 (8H)

Orchid Gardens, Rte. 1, Box 290, Grand Rapids, Minnesota 55744. Catalogue 25¢ (20H)

Gardens of the Blue Ridge, Ashford, McDowell County, North Carolina 28603 (26H)

The Three Laurels, Marshall, Madison

The American Fern Society has reprints of Dr. Huttleston's original article available for 25 cents each. These may be secured from the Treasurer of the Society by enclosing payment with your request. At this time the Treasurer is Mr. Robert G. Stolze, Department of Botany, The Field Museum, Chicago, Illinois 60605.

Helen S. Witty

Unfurling fern croziers, often called "fiddleheads," are a spring delight.

Marjorie J. Dietz

The Christmas fern *(Polystichum acrostichoides)* adapts to most home gardens.

County, North Carolina 28753 (21H)

Francis M. Sinclair, RFD 1, Newmarket Road, Exeter, New Hampshire 03833 (W&R30H)

Stella J. Skiba, Bluff Road, Salem Depot, New Hampshire 03079 (S&P17H)

Edelweiss Gardens, 54 Robbinsville-Allentown Road, Robbinsville, New Jersey 08691. Minimum order $5.75. Catalogue 35¢ (46T)

Mincemoyer Nursery, County Line Road, Rte. 526, Jackson, New Jersey 08527. Minimum order $5 (21H)

Julius Roehrs Company, P.O. Box 125, East Rutherford, New Jersey 07073 (W&R50T)

Spring Hill Nurseries, Tipp City, Ohio 45371 (W&R4H)

Wayside Gardens, Mentor, Ohio 44060. Catalogue $2 (9H)

Kramers, 4543 SE Harney Drive, Portland, Oregon 97206 (C&C, English cultivars)

Lakeland Nurseries Sales, Hanover, Pennsylvania 17331 (7H)

Vick's Wildgardens, Box 115, Gladwyn, Pennsylvania 19035. Minimum order $5 (16H)

George W. Park Seed Company, Greenwood, South Carolina 29646 (S5)

Beersheba's Wildflower Gardens, Beersheba Springs, Tennessee 37305 (W&R18H)

Northhaven Gardens, Inc., 7700 Northhaven Road, Dallas, Texas, 75230 (W&R11T)

Jamieson Valley Gardens, Rte. 3, Box 648, Spokane, Washington 99203. Catalogue 50¢ (7H)

Laura's Collectors' Garden, 5136 South Raymond Street, Seattle, Washington 98118. Minimum order $10 (20H)

Lamb Nurseries, East 101 Sharp Avenue, Spokane, Washington 99202 (6H)

The Wild Garden, 8243 N.E. 119th, Kirkland, Washington 98033. Catalogue $1 (31H)

Woodland Acres Nursery, R.D. 2, Crivitz, Wisconsin 54114 (8H) ◆

Selections among indoor ferns are no longer confined to the ubiquitous Boston fern

THE FANCY FOLIAGE OF THE INDOOR FERN

F. Gordon Foster

From the New York Times, January 17, 1971
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AGAIN, as in the Victorian period, there is a growing interest in ferns as house plants. Along with other things in a fast-changing world, fern selection has been updated and is no longer confined to the Boston fern with its endless variants.

House ferns, mostly of tropical origin, do best with a moderate day temperature of 72° F. and a cool night temperature of 65° F. where reasonable humidity is supplied by a humidifier or hand spraying. With a few suggestions on choice and some tips on culture, fern culture can be as easy and successful as growing other house plants.

Ferns vary greatly in size and character. Some, like the golden polypody (*Polypodium aureum*) are large and robust in color and texture. Others, especially the smaller maidenhairs, are delicate in shade and soft to the touch.

Several holly ferns grow throughout the world. Two favorites from the Orient are excellent for the home. Start with the Japanese holly fern (*Cyrtomium falcatum*) with dark, waxy green leaflets. Each leaflet has sharp prickly spines, suggesting Oregon-holly rather than a fern. Select if possible the variant, 'Rochefordianum.'

Fortunately, Japanese holly fern tolerates dryer atmosphere than many others and its strong leaflets can be cleaned with a damp cloth. If a small plant is selected, it probably will have only three or four three-lobed leaves. As it grows, subsequent leaves will become more and more like holly, ultimately reaching heights of 12 to 24 inches.

The Tsus-sima holly fern (*Polystichum tsus-simense*) is much smaller. This plant, with fernlike leaves, is slower growing and good for the terrarium. It thrives in the higher moisture of the glass enclosure, where it is compatible with native woodland plants.

The Boston Ferns

Boston ferns have never lost their foothold in the American home. Originally a mutation of the wild swordfern of Florida, *Nephrolepis exaltata,* Boston ferns have maintained first position in sales since their inception in 1894. The earlier varieties had pendulous leaves 6 or more feet long like their ancestors, and required a high pedestal or planter to keep them from touching the floor. Subsequent horticultural treatment has produced smaller and bushier plants which are more desirable for the home today.

Originally Boston ferns were sold with complex names. Nomenclature has been greatly simplified until now such mundane names as 'Fluffy Ruffles' can be found in florists. Reversion to the ancestral form of the Boston fern is frequent, and leaves on one plant can range from a lacy-cut pattern to the once-pinnate leaf somewhat like our native Christmas fern. While there is great similarity in the leaf pattern of these two ferns, there is no generic relationship.

Large Boston ferns currently cost between five and seven dollars. I prefer starting with smaller plants in 3- or 4-inch pots. Three small plants may be placed in a large pot and packed with damp peat moss. Grouping smaller plants gives better appearance than one large one. Later the plants can be used individually or placed in a table planter.

Bird's-nest fern (*Asplenium nidus*) makes a delightful focal point when placed on a low windowsill or bay. Here is a fern with simple, tonguelike, glossy green leaves that is not only handsome but requires less attention than other plants. Its leaves uncurl from a central mass of heavy black scales, and by maturity each will have developed a strong dark midrib which contrasts with the green. Where unfolding leaves have chewed edges, be on the alert for tiny greenhouse snails. These pests operate while the leaves are still in the tightly coiled stage beneath the protective black scale cover.

Maidenhair Ferns

Maidenhair ferns are always admired. Actually there are about 200 species of maidenhairs growing throughout the world, mainly in warmer areas. Most have delicate leaves reminiscent of the ginkgo tree. All have characteristic, prominent forking and reforking veins.

The best maidenhair selections for the home are Venus maidenhair (*Adiantum capillus-veneris*) and rosy maidenhair (*A. hispidulum*). Venus maidenhair has soft, light applegreen leaves and is more popular. Croziers of rosy maidenhair are rose colored, and as the leaves come to maturity the color changes to a dark reddish-green shade. A close look will reveal tiny spines on the stipes and surface of the leaves.

'Ocean Spray' and 'Pacific Maid' maidenhairs are also good and have overlapping leaflets of light green. These bushy plants are fine for the fern dish or small planter. All of these ferns are fast growing and for continued healthy growth should be divided and repotted each season.

Some ferns are epiphytic and grow naturally in trees or over rocks. These plants, when grown in hanging baskets or mounted on cork-bark plaques, do well in the home. One of the easiest epiphytes to grow is golden polypody (*Polypodium aureum*). Like so many ferns of this group having long, climbing, fuzzy rhizomes, it is indiscriminately called "rabbit's-foot fern."

The plant is a native of Florida and commonly appears on the latticelike bark of the cabbage palmettos. The first leaves of young plants may have only two or three lobed segments. Subsequent leaves develop large multi-segmented blades and have long dark stipes. With favorable growing conditions, the plant may reach a height of 24 inches in the home.

A more interesting plant than the native golden polypody is the horticultural variant 'Mandaianum.' This variety has deep wavy-edged leaves, and with its powdery blue-green surfaces, it becomes quite showy. Both polypodies do well as potted plants or in hanging baskets.

Button fern (*Pellaea rotundifolia*) is a native of New Zealand. A good house plant with dark green, almost round leaflets, it is as unusual as unfernlike. While generally grown in pots, it can be grown in an open hanging basket or wire ball to facilitate root moisture and proper drainage.

While Davallias have long been my favorites, I think that the New Zealand mother fern (*Asplenium bulbiferum*) is my second choice. This fern normally thrives in deep, damp ravines where its green feathery leaves reach lengths of 6 feet. Sometimes referred to as "viviparous" or "live bearing," in addition to reproducing by spores, this species is capable of producing offspring by vegetative budding. Long before the plant reaches full stature, small plants may be seen budding from the parent leaves.

In its native habitat, the mother leaves become so heavily laden with offspring that they touch the ground, allowing the young plants to root and become independent. In the home, new plants are quickly propagated by placing the budded leaves on damp peat moss. It takes about three months in a moist growing chamber to get a little fern ready for planting. Plantlets from ferns only three or four months old are common.

Those who have left-over Christmas

poinsettias in all probability have two or three small ferns growing at the base of the tall plant as green filler. These ferns generally are the fast and easy growing *Pteris cretica*, sometimes called Cretan brakes, native of the Mediterranean area.

Before discarding the poinsettia, remove the ferns and replant them in smaller pots. Chances are that you have a Victorian brake, a fern with dark green and silver variegation. This plant has dimorphic leaves, that is, differently shaped sterile and fertile leaves. The sterile leaf is prettier; the fertile leaf carries spores along the edges of narrow, elongate leaves.

Staghorn ferns, with their antlerlike leaves, are really curios of ferndom and never fail to gain attention. These epiphytes are native of faraway tropical countries and, contrary to popular belief, they can be grown in the home.

Living in trees, these ferns tightly wrap the shields around the irregular bark, catching and holding both rain water and decaying organic material needed for growth. Staghorns may be grown in well-drained pots but all appear more realistic when mounted on cork bark plaques. Water plants thoroughly and allow them to come to almost dryness. In addition to reproduction by spores, this group also propagates from its "pups," small plants peeking out from behind the sterile leaves.

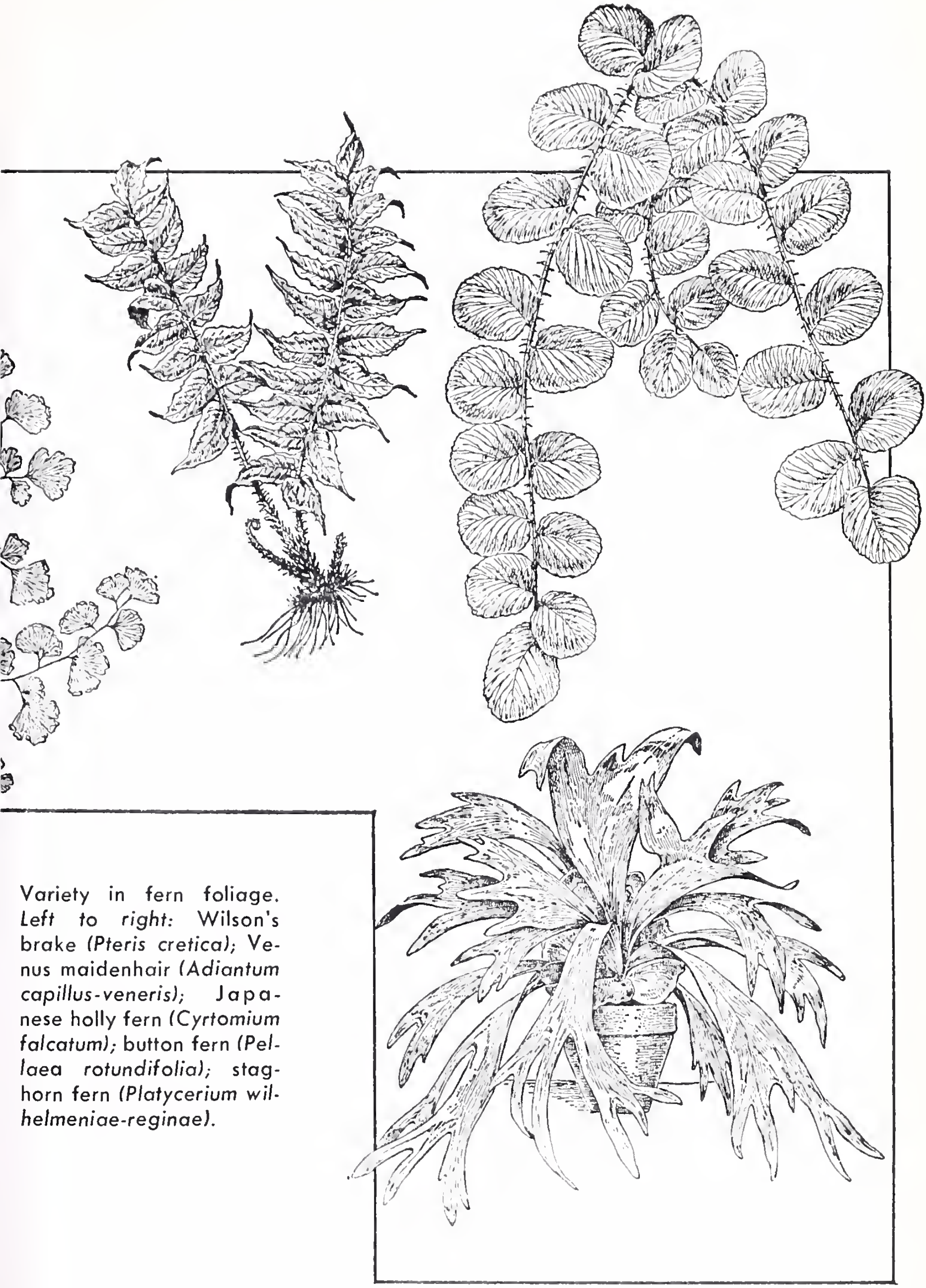
During the winter months, ferns do best in sunshine. If the light appears too strong, it can be tempered by curtains or Venetian blinds. For years I have used fluorescent lamps, two 40-watt tubes about 18 inches above the plants, clock-controlled, for 14 hours each day.

For successful fern culture, a moist atmosphere is essential. Grow plants over a pebble tray kept filled with water. In lieu of a humidifier, use a hand or tank sprayer at least once each day. Common with most plants, roots must never come to full dryness, but avoid over-watering.

Be willing to repot plants when needed. Generally, late summer is best as the roots can become adjusted before the winter months. Commercial African-violet soil is a good mix. For those requiring a greater quantity, mix equal parts of screened topsoil, humus, and sand. Soil for maidenhairs is improved by adding ground oyster shells. Limit the soil mix for epiphytic ferns to humus or leafmold blended with chopped fir bark. During winter, one application a month of dilute fish oil emulsion is beneficial.

Matthew Kalmenoff

Ferns are relatively pest free although it is best to guard against the white, waxy mealbug and the various turtleback scales. Most ferns are killed by commercial insecticides. It takes time, but it is better to control these pests by touching them with isopropyl alcohol applied with a Q-tip. Flush the leaves at the sink for plant cleanliness and to remove any of the insects' sticky residue. ◆



Variety in fern foliage. *Left to right:* Wilson's brake (*Pteris cretica*); Venus maidenhair (*Adiantum capillus-veneris*); Japanese holly fern (*Cyrtomium falcatum*); button fern (*Pellaea rotundifolia*); staghorn fern (*Platycerium wilhelmeniae-reginae*).

GROWING BEAUTIFUL HOUSE PLANTS FROM SEED

Ruth Marie Peters

From NATURAL GARDENING, November-December, 1972

THE joy of growing house plants from seed is unlimited. I discovered this some years ago when I neglected to remove a faded amaryllis blossom and the seed case (ovary) began to swell. It continued to increase in size rapidly and split open in about a month, revealing flat black seeds neatly stacked like poker chips. I sowed the large seeds at once in a clay bulb pan with an inch of gravel at the base for drainage, topped by a mixture of equal parts river sand and garden loam. (Now I use a sterilized potting mix and add 1/5 part perlite.) I placed the seeds in a spiral pattern over the surface, leaving an inch of space between each seed, and covered them with ¼ inch of the sand/loam mixture.

Amaryllis seeds like bottom heat to speed germination, so I devised a simple heater which has served me well many times. I found an aluminum cooking pot in the kitchen that just fit the circumference of the clay pot in which the seeds were planted, and used an extension cord with a 7½ watt light bulb to place in the aluminum pot, with the clay pot above supported by its own rim on the rim of the cooking pot. The small bulb provided steady, gentle heat and germination took place within a month. First a little green pierced the soil surface, then leaves, like little blades of grass, appeared. I placed the pot in a sunny window and made sure the soil did not dry out. Every two weeks I added a soluble plant food to the water. The growth was completely fascinating—small bulbs were soon noticeable at the base of the leaves and these slowly continued to increase in size. When they became crowded in the pot, I gave each little bulblet its own 2½-inch clay pot and continued to provide larger pots as the bulbs grew. The first blossom took 2½ years to appear—a long wait, but worth it. And that was fairly fast—some of the bulbs took four years to flower, but each time a bulb produced its first flower it was a heartwarming experience.

I did not sit idly waiting all those years. The grow-your-own-house-plants-from-seed bug had found a new and willing victim. Orders went out to seedsmen specializing in house plant seeds. Then every window became full of containers of seedlings, or seeds about to germinate, and every spare moment was used to transplant crowded seedlings into larger containers. When space became scarce, friends eagerly absorbed the overflow, and the local library and school windows became extensions of my own. I increased my space with a small greenhouse at home and later on, with a commercial greenhouse where I grew from seed many of the plants offered for sale.

But all seeds are not as large and easy to handle as those of amaryllis. When I cross-pollinated two African-violet blossoms and let the seed pods ripen, the seeds within were as fine as dust and the seeds that ripened on my various begonias were like powder. With seeds as minute as these, the sowing surface must be smoothed out evenly, then the seeds carefully sprinkled over it, making every effort to scatter them evenly so they won't be bunched in one place. No soil is used for covering, but a pane of glass or plastic over the rim of the pot helps keep the surface of the sowing medium moist. For small seeds like these, I find small plastic containers most convenient. I do not punch holes in the bottom but am extremely careful to moisten the medium just enough, not too much or too little. Then after the seeds are sown, I snap on the plastic cover and wait for the first green shoot—the signal to remove the tight cover and just push it back a crack so air can enter to help prevent damping off—a disease that kills seedlings most often when conditions are too moist and unaerated. African-violet seeds germinate in about twenty days and must have light in order to do this. Some seeds, like cyclamen, need total darkness in order to germinate. Begonia seeds also prefer to germinate in a light location; they take about fifteen days.

Once the seedlings have their second pair of leaves, they are usually ready to be transplanted into larger quarters. The first time you transplant them, they will not need individual containers, but can be planted an inch or two apart in a large flat or pot. Just before they begin to crowd each other, they should be transplanted again, each time giving them more space, until they are finally large enough to be given a pot of their own. The same soil mixture used for sowing seeds can be used for transplanting the seedlings. I do not add plant food to the soil, but instead water the seedlings with a soluble plant food according to package directions.

The foliage plants are fascinating to grow from seed. Aralia, ficus or rubber plant, philodendron, schefflera, pepromia, palms, pittosporum, coffee plant and banana are just a few to try.Palm seeds take from two to six months to germinate, while coffee and banana may take two months or up to a year or more. Most of the others, however, take from about two weeks to a month to start.

Living stones are succulents that look more like stones than plants, and I found these intriguing to grow from seed. They take about two weeks to germinate and must be watered sparingly and given good air circulation to avoid rot. In the beginning they are green, but as they grow they begin to take on the mimicry colors and it is interesting to watch the changes day by day. A mixed packet of cactus seed was equally rewarding. Most of the seeds germinated in two weeks, and from then on, the little seedlings gradually took on their adult form and it was fun to identify each one as its characteristics became apparent. Last December I embarked on my latest cactus adventure, cross-pollinating Thanksgiving and Christmas cactus. The seed pods developed slowly but surely and in August of this year were still on the plants.

George W. Park Seed Co.

Hypoestes sanguinolenta, a foliage plant to grow from seed. Pinch tips of new growth to promote bushiness.

Another plant I found easy and worth growing from seed was *Primula malacoides,* the fairy primrose. Don't choose *Primula obconica* unless you are sure you aren't subject to the rash it produces on sensitive skin. With the fairy primrose there is no such danger, and I grew more than a hundred plants from one packet of seed. They bloomed in a few months' time to decorate my own Christmas windows and serve as Christmas gift plants for numerous friends and neighbors. The key to growing primroses successfully indoors is a cool temperature. Seeds need light and will sprout in less than three weeks. The plants should be transplanted into larger containers as soon as they have their second pair of true leaves. The final move should be into individual 5-inch pots. Water with soluble plant food regularly and keep in a cool temperature. Chinese primrose, *P. sinensis,* is also easy to grow from seed. There are many named varieties to choose from: salmon-pink 'Beauty of Nice'; bright orange-scarlet 'Dazzler'; carmine 'Bright Future'; crimson 'Defiance' and many others. They like a cool 50° F. night temperature in order to do their best, and seed should be started in April for blooming plants during the winter.

The Christmas cherry is easy to grow from seed. 'Covent Garden' strain grows only 9 inches high and so compactly that pruning back for shape is not often required. Christmas cherry 'Jubilee' is an 8-inch dwarf and spreads to 10 inches or more. The seeds take about 20 days to germinate. The ornamental peppers are equally colorful and grow quickly from seed. 'Fiesta' is only 9 inches tall with white fruits that turn a vivid red. 'Fips' first has green fruit which gradually turns bright yellow, then orange and finally red. Seeds of all these are readily available.

Some nurseries offer mixed packets of house plant seeds and contrary to popular belief, they are not ideal for the beginner, because the seeds of different species may germinate at different times. In addition, you may not know what you are growing for some time, since leaves must mature before you can identify the plants. For the advanced indoor gardener, however, such a packet of seed can be a lot of fun, and it becomes a challenge to try to identify each seedling when its first true leaves appear. If you do sow seed from one of these mixed packets, keep the seed container moist for at least a year as some seeds may take that long to sprout.

Often volunteer seedlings appear in the soil of house plants. Last winter, for instance, I had about ten seedlings of impatiens, which came up by themselves in various pots of house plants. Begonias also often seed themselves and so do coleus. Christmas cherry may, too, if you do not collect all the fallen fruits.

Perhaps all house plant enthusiasts have at one time or another planted grapefruit, orange, or lemon seeds which germinate in about two weeks. It's just as easy to grow the dwarf orange from seed, but your efforts will not be rewarded with fruit—something that happens on grafted plants. If you want to grow something edible in your window, why not try one of the small tomatoes like 'Pixie'? They need a sunny window and each plant requires a 6-inch pot. Regular watering and feeding plus a bamboo stake for support are musts. ◆

Fireplace Gardening

DO you bring too many potted plants indoors each fall for the number of window sills you have? If you have an unused fireplace, put a table-type fluorescent light stand in it and you will be amazed at the number of plants it will accommodate. It will be a conversation piece and a spot of glowing beauty in any room, day or night. I bank tall plants with variety in color and types of leaves at the back and sides, then the center front is accented with blooming African-violets. The Gro-Lux type of fluorescent lamps emphasize the jewel-like colors of the flowers. Watering is carefree as spilled drops cause no harm on a fireplace. My plant lights are turned on when I get up in the morning and off at bedtime. In that way I can enjoy the beauty of the flowers while awake and they can sleep while I do, since a period of darkness is necessary for them. How much prettier is this mass of living color than a static screen or a slowly dying bunch of evergreen branches!—*Sallie C. Johnston,* (Garden Club of America BULLETIN, November, 1972)

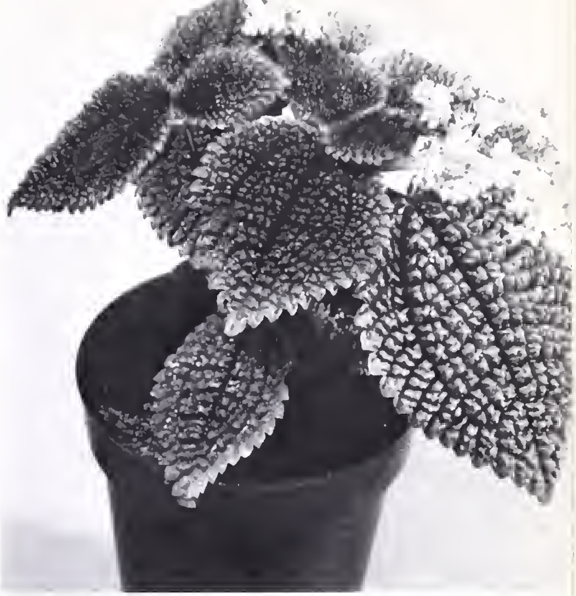
AN ATTRACTIVE FOLIAGE PLANT

George Kalmbacher

PILEA 'Moon Valley' is a house plant as attractive as it is unusual. What recommends it is its foliage, which is of a distinctive, cheerful color and shows bold longitudinal, arching nerves, with the whole surface of the leaf covered with tiny upright papillae. This causes the aggregate effect of tiny spots of color, a pattern suggesting loose knitting. Its flowers are not impressive, so this is definitely a foliage plant.

This pilea is a patented plant that has been on the market a comparatively short time. The patent number is 2756, dated Aug. 8, 1967. The owner is Marion R. Mulford, Altamonte Springs, Florida, who discovered the original as a vegetative sport in his greenhouses in Lebanon, Ohio, deriving from an unknown pilea species collected in Central America. He observed among cuttings that one of them was so obviously different as to be a vegetative sport, attractive and distinctive enough to be perpetuated. The new plant differed from the old in being larger in size, with leaves that were larger and heavier and with a different, more involved texture and structure.

It is this enlargement and the vitality in vegetative reproduction and complicated leaf structure that suggest to the writer the possibility of tetraploidy (twice the number of chromosomes) being present in *Pilea* 'Moon Valley.' There is in addition a phenomenon attached to the cuttings of this sport that seems to reinforce that opinion, and that is that some of the cuttings are monoecious (flowers only of one sex on an individual plant), while others have both male and female flowers. Ordinarily if you have a sport of a male plant, it stays male, and if female, only cuttings with female flowers are produced. In this case it would seem that the sexual characteristics inherent in the species as a whole have been transferred to the new unit.



Arthur Norman Orans

Pilea 'Moon Valley'

Since the specific name of the mother plant is not known, not much can be understood or said about it botanically. As another matter, error has crept in since it is known to be sold under the genus name *Bertolonia*. *Bertolonia* belongs to the melastome family with flowers very different from those of *Pilea*, which belongs to the nettle family. The error probably arose because the leaves of this plant resemble those of *Bertolonia*—with a similar veining pattern and with both oppositely attached to the stem. Someone with a knowledge of plants (but not enough!) decided on *Bertolonia*.

Regarding culture, my colleague, Brenda Weisman, gives these pointers. It is a plant requiring high humidity—thrives in a terrarium, or over pebbles kept in water, or should be sprayed frequently. In summer it must be kept out of direct sun. In winter an hour or so of early morning or late afternoon sun is all right, but otherwise give it the brightest light in the shade, or it can be kept in that bright light for the whole day. Otherwise treat it like any other house plant as to potting soil. Ordinary room temperature is satisfactory. ◆

Alaskan winters are long, and house plants have a special meaning . . .

HOUSE PLANTS IN ALASKA

Mary-Elizabeth Lee

IT WAS MIDNIGHT when the *S.S. Columbia* docked at Juneau in mid-September of 1941. Despite the hour, several of us, all new to Alaska, went ashore and explored the deserted streets. I had just left my position at the Brooklyn Botanic Garden to come live in Alaska, and my eyes, always on the lookout for something growing, were attracted to a magnificent specimen of a plant hanging in the window of a drugstore; it was a large cascade of white flowers that seemed to glow in the dark. This was my first sight of what became one of my favorite house plants, the white form of the Italian bellflower (*Campanula isophylla alba*). I could hardly wait until I possesssed not only this glowing beauty but also the softer, lavender-colored form. For years these were among the treasures which were swapped and traded by me and my friends.

Like many growers, I succumbed to the craze for African-violets. I accumulated as many different kinds as I could, and by the time of the Alaska earthquake in 1964 I had ten lovely specimens, all with many flower buds set, in a sunny window. I was away at the time, and when I came home a week later they were a sad sight. The furnace had been off and the plants had been badly chilled. However, my family had watered them faithfully. I trimmed off the leaves and mourned for the lost promise of bloom (little enough loss when compared to the lost lives and shattered homes of some of my friends). It wasn't long before new little leaves began showing and eventually these plants recovered and bloomed again.

Favorites of mine which need intense sunlight are the beautiful coleus with colored leaves (remember to cut it back if it begins to be leggy) and that good old standby, grandmother's geranium. These I no longer try to grow unless I can persuade my husband to let me smuggle them into the greenhouse. Once having the satisfaction of producing sturdy, stocky specimens in robust health, I cannot bring myself to give any time to the stringy, anemic-looking ones which are all I can manage in my windows.

One of my plant "children" is an azalea which was given to me at Easter six or seven years ago. Although I accepted it with joy, I had inward misgivings for I understood azaleas to be difficult under home conditions. Actually, it has bloomed nearly every year. I learned that it is important to never let the azalea dry out. The soil must be kept well dampened. Azaleas often come planted in what looks like pure peat. After the original burst of bloom is over, it is wise to turn the plant out of the pot and replant in good garden soil well mixed with peat. This plant thrives in an acid soil, but pure peat lacks sufficient nutrients for continued growth. After all danger of frost is over in Seward, I set the plant out in the garden using a section of sewer pipe, about 10 inches long, for a planter. Frequent watering is essential and, in fact, given adequate drainage, overwatering seems not to hurt this plant. Then, before the first hard frost, the azalea is brought back into the house, repotted in a container large enough for adequate watering. Some peat is mixed with the garden soil. I try not to break off any of the branches, for they will soon show buds in the "springtime" of my home. Brought in around the first of October, the azalea blooms early in November and lasts through Thanksgiving. After the flowers are gone I cut back the longer branches, especially those that have borne flowers. Of course, if you live in an area where azaleas are hardy outdoors, you can disregard these notes and simply plant them permanently in your garden, but I would not trust mine to a winter in our part of Alaska, even though some of them came originally from the Himalayas!

It is difficult to grow fine specimen cacti and other succulents on the Alaskan windowsill because of the long winter and its extended periods of darkness, but once the gardener forgets how they look in Arizona and New Mexico, their etiolation is not so disturbing. They *can* be grown in Alaska. If you are away from home a great deal or are too busy to remember to water your plants often, you may be much happier to confine your house plant adventures to those species which don't thrive on much water, anyway.

Most house plant books advise against growing roses indoors, but in Alaska, where our only dependable cultivated rose is *R. rugosa* (and a pale yellow one which may be Father Hugo's), I have known the satisfaction of roses grown as house plants. Such a plant needs a large container for its sizable root system, and it needs a rest period during the winter; any blooms are indeed a great achievement, but it can be done. At one time I had several of the miniature roses known as "Tom Thumb"; they are easier to grow indoors than the common garden varieties (and as far as I know, they have been house plants for so many centuries that their original outdoor home is still uncertain), but they, too, need a rest during the winter. Put them where they won't freeze and water them only sparingly during their dormant period.

For years I have had the custom of planting something on New Year's Day, usually bulbs. My favorites, and most successful, are various kinds of narcissus, especially paperwhites and daffodils, but tulips will perform successfully if the conditions are right. I obtain the bulbs early in autumn, before any danger of parcel-post packages freezing enroute, and store them in the vegetable crisper in an old refrigerator. Then, beginning in December or on New Year's Day and every week or so thereafter until all are used, I pot up a few and store them in a cool, dark closet until the shoots are about 2 inches high and the roots are showing through the drainage holes. They must not dry up! Nor be very warm, nor get any light. By the time the shoots are well above ground, the roots should be sufficient for good growth. Then bring them into the light and warmth, keeping the room a little on the cool side. I found that the best place was under the fluorescent lights of my son's workbench (just as well that he now has his own home!). All this is really a very simple procedure, but in the bleak days of the Alaskan winter before spring is really believable, a daffodil or a tulip seems like such a miracle to a shut-in that you will be thought some kind of wonder-worker! After the blooms fade, ripen off the bulbs

Ward W. Wells

This asparagus-fern has remained in the same jardiniere for twenty years or more in good condition in the Alaskan home of a friend of the author's.

The azalea is one of the author's favorite house plants to brighten the dark Alaskan winter. Her plant is summered outdoors, then brought indoors in October and repotted in a humusy soil mixture. It usually blooms during the month of November.

by watering only moderately until the leaves wither and eventually plant them in your garden, where they will some day bloom again.

In Alaska as in many other parts of the United States, a good supply of potting soil is sometimes hard to come by. One very welcome Mother's Day gift I recall was a load of topsoil and cow manure for the garden! During the winter I thaw out my porch boxes in the kitchen and use the soil from them. For most house plants, garden soil can be extended by adding some sort of peat.

If you live in a community too far from a "dig it yourself" situation, better buy your potting soil from a good local garden-supply house; "soil" sold in interstate commerce is often merely some form of peat. I prefer soil from an old pasture, or shaken out from clumps of grass. If grass will grow on it, it can't be too lacking in essential growth elements. The good, rich, black earth which one sees when ground is being cleared in Alaska is too frequently the remains of an ancient bog, very acid and lacking the minerals necessary for plant growth. It is excellent for cranberries and currants, but not for house plants.

Repotting a plant that seems to have outgrown its container is sometimes a problem. I remember one African-violet in a rusty coffee can that gave me quite a struggle. (I keep my tetanus shots up-to-date.) Usually a plant will slip out easily when turned upside-down and thumped on the edge of the potting bench (kitchen sink). However, I was once rather surprised after struggling to shift an old gardenia into a new tub to find that it had rather skimpy roots. If the tub had not fallen apart the plant might just as well have remained in it. The record in my experience for a house plant in the same container is an *Asparagus sprengeri* belonging to a friend of mine. The plant was given to her in 1925 and has lived in the same jardiniere for at least twenty years and probably longer. It seems to thrive and it blooms from time to time with little pink bells. ◆

Man and beast are increasingly on the move . . .

THE NEW MOBILITY

Warren Balgooyen

From Teatown Trails, Winter, 1972

SHIFTING patterns of population and a quest for new frontiers are typical of our time. People have stopped their east-west movement in this country. Now the trend is south. Oppossums in the meanwhile have been moving north. So have our cardinals, tufted titmice, and mockingbirds. In the coyote kingdom of the West, the order of the day is "Go East, young pup." They are now found as far east as Maine. Whether you are a cook or a carpenter, a coyote or a cardinal, the current word is go.

What is the explanation for all this movement? We are like pawns in some gargantuan game of chess with Mother Nature planning the strategy. Perhaps one of the chief forces at play is population pressure. Take the mockingbird, for example. This bird was as southern as Jefferson Davis until recent years. A vastly increased population to the south since 1957 may be responsible for its push north. Prior to 1951, it was not known to nest in New York State. Now it nests as far north as Saratoga County.

The Once-rare Cardinal

Before 1930, the cardinal was an extreme rarity anywhere in our state. We should all be grateful for the northward movement of this beautiful bird. So common have cardinals become that bird watchers to the north may now whistle, "Can't get a *blue*bird, a *red* one will do."

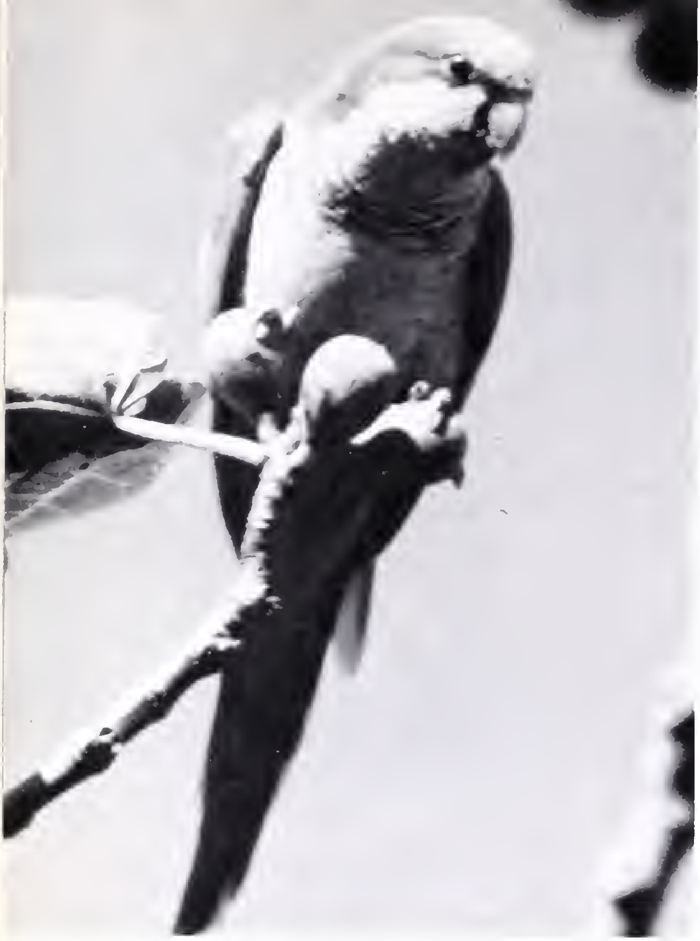
The same factors responsible for the decline of the bluebird may be acting in favor of another southerner, the tufted titmouse. Because this bird is a forest species, the gradual overgrowth of abandoned farmlands by second growth timber has provided more habitat. An increase in population south of New York may also have helped to push this bird northward.

Southerners can take heart that there is also a partial shift in some bird populations towards the South. Most notable is the evening grosbeak. This was a bird of the boreal forest as recently as 1941 and considered very rare even in winter in our area. Now common, it is unknown whether his southern movement was initiated by seed and cone failures to the north or by the easy availability of seed from bird-feeding stations. Feeding stations have increased by geometric proportions in recent years in the relatively southern areas of dense human habitation. Whatever the cause, this Northeast "yellow bird" has truly "Come on down."

Several bird species have extended their natural range with the help of man. The house finch, indigenous to our West Coast, was introduced to the East by pet dealers in New York City. The National Audubon Society, by a quirk, was an accomplice in its release. When Audubon sought to crack down on the proprietors of pet shops selling this protected species, the dealers simply released their birds to dispose of the evidence. The finches survived and prospered in New York State. So far, at least, they have not become a pest species.

The Monk Parrot Arrives

An introduction of more questionable outcome is the recent establishment of a breeding population of the monk's parrot in New York State (and more recently in the climatically varied states of Michigan, Wisconsin, Florida, and New Hampshire). This new bird, another escape from captivity, took everyone by surprise. The monk's parrot is native to Brazil and the southern portion of South



O. S. Pettingill, Jr. from NATIONAL AUDUBON SOCIETY

The monk parakeet on a date tree in its native Argentina. The bird has escaped from captivity in the United States and its presence has been reported from several regions —mostly northern. It is presumed to have survived because of the prevalence of winter feeding stations stocked with fruit and seeds. The bird is attractive and friendly. It is 11½ inches long, its back green-gray, its belly yellow and its long, pointed tail feathers, blue-green. Its bill is flesh-colored.

America. In its native area it is considered a pest, destroying fruit and grain crops. No one knows how it will behave here. So far, the bird has attracted much interest and sympathy from bird lovers who admire his adaptability. The parrot has found a welcome mat in New York State in the form of a myriad of bird-feeding stations. It will remain to be seen whether we have nurtured a friend or a Frankenstein.

Perhaps the most celebrated bird to ever visit the Teatown area was the Lewis's woodpecker. This avian Marco Polo wandered east in 1954 from his native haunt of the Pacific Northwest, and appeared at the home of Gerard Swope, Jr. It has been theorized that the bird was forced east by storms. The idea that this and other wandering birds may have been caught up in the jet stream is unlikely as these fast moving air flows are at too high an altitude. Were this the vehicle of such travels, our feathered friends would no doubt have to qualify as members of the Jet Set.

Our Lewis's woodpecker caused quite a stir—attracting such a distinguished bird enthusiast as the late John Kieran. So far, no other Lewis's woodpecker has followed in his path—as men followed Meriwether Lewis, the eminent explorer for whom the bird is named. We do not know how many trees the woodpecker marked en route, but if trail blazing was the bird's mission, he has failed. Perhaps he would have done a better job in the company of the Clarke's nutcracker, which, incidentally, was named after the other leader of that intrepid team. ◆

GYPSY MOTH CONTROL

Practical methods for the home gardener and conservationist

From Arborist's News, October, 1972

YOU can do something about the gypsy moth. While researchers continue to work on an elusive total solution to the problem, there are several methods for protecting home gardens and trees from the nuisances that gypsy moth caterpillars cause during the early summer months.

Between October and late April, destroying egg masses is a convenient control method. During this period, the buff-colored, inch-and-one-half long, fuzzy egg clusters are more in view, less hidden by the tree's foliage. These clusters, each containing several hundred eggs with the possibility of releasing several hundred caterpillars in time, should be easy to spot on the undersides of tree branches, along trunks, or in protected areas. They will most likely be found on or near tree species that the caterpillars are known to attack most often.

The gypsy moth's favorite trees—those that are most generally defoliated by the insects—include apple, speckled alder, basswood, gray and river birch, hawthorn, oaks, poplars, and willows. Less desired, but still attacked, are black, yellow and paper birch, cherry, chestnut, elm, black gum, hickory, hornbeam, larch, maples, and sassafras. Older gypsy moth caterpillars devour the foliage of several tree species that as younger caterpillars they would pass. Hemlock, southern white cedar, and the pines and spruces native to the East are in this category. The gypsy moth tends to avoid ash, balsam, butternut, black walnut, catalpa, red-cedar, flowering dogwood, American holly, locust, sycamore, and yellow or tulip poplar.

Destroying Egg Masses

Once located, egg masses can be painted with creosote and left on the tree, or scraped off with a knife or a flat wooden stick. If the creosote method is used, caution is advisable, since creosote can produce eye and skin irritations. If the scraping method is used, the eggs should be collected and then either dropped into a can of kerosene or burned until they are destroyed. Merely scraping the eggs off will do no good, since eggs can still hatch on the ground.

Since individuals are often allergic to the hairy caterpillars, or to the hair covering their eggs, it is wise to avoid contact when removing them.

Protection Against Caterpillars

Protection against existing gypsy moth caterpillars during the period when defoliation is occurring—from mid-May through mid-June—is more time-consuming and involved. One method takes into consideration the daily habits of this pest. Since older caterpillars routinely seek protected spots to hide in during daytime hours, it is possible to entice the gypsy moth into the seeming comforts of a 5-inch-wide strip of burlap, tied around a tree trunk about 5 feet from the ground. The burlap strip should be folded over to form a flap, which can be lifted to permit caterpillars to be removed and destroyed each day.

This method should be used even after all visible egg masses have been destroyed in an area, in case some did escape detection. This method will also serve as protection against those tiny, newly-hatched caterpillars that may be blown in by wind currents.

A sticky substance called Tanglefoot can also be used to protect trees. Applied in a strip around the trunk, Tangle-foot works somewhat like flypaper, catching and holding caterpillars as they migrate up and down the tree.

Both methods require constant attention when keeping large outbreaks of caterpillars under control. In using these methods in a heavy infestation, you might have to choose between protecting tree species that tend to be most severely defoliated, and protecting the most valuable trees, if many trees need protection, the use of recommended insecticides might offer the best solution.

Insecticides provide a high degree of foliage protection. Hand-operated sprayers can be used to apply insecticides to shrubs and small trees. For tall trees, a custom-spray applicator with proper high-pressure equipment should be hired.

The insecticide Sevin can be applied either from the ground or the air. The insecticide Gardona and the microbial agent *Bacillus thuringiensis* can be applied from the ground to effectively control the caterpillars. As in the case of all such substances, directions must be followed carefully both to insure effectiveness in protecting trees from defoliation and to prevent injury and undesired effects on other organisms.

Caterpillars are full-grown by late June. They then stop feeding and seek a protected place to pass into the pupal stage. They emerge as adult moths in August. While the insects feed only as caterpillars, collection of the brown pupal cases during the summer can also make a beneficial impact on the population level the following year. ◆

Lethal Yellowing Disease Breakthrough in Jamaica

JAMAICA appears to be on the road to solving her problem of lethal yellowing disease of coconuts. Research carried out by the Jamaica Coconut Industry Board with the assistance of FAO scientists has discovered a causal link between mycoplasm and lethal yellowing disease, according to a report from Jamaica. (*Editor's Note:* See also pages 52 and 60.)

Mycoplasm, tiny micro-organisms resembling partly bacteria and partly viruses, was first suspected in 1968 when a Japanese virologist reported that the tiny bodies, known for some time to cause disease in animals and human beings, may cause disease in plants. Both the East Malling Research Station in Britain and the Boyce Thompson Institute for Plant Research in New York, to whom samples of tissues from diseased and healthy trees had been sent for testing, reported the presence of mycoplasm in the tissues of diseased trees. No trace of the disease was found in the samples of healthy tissue.

The discovery, described as a "breakthrough," is said to be the first and vital step in the struggle against a scourge that has already destroyed one-third of Jamaica's tall coconut palms. An estimate of the number of trees that died in 1971 has been put at "anything between 60,000 and 100,000." Research is now centered on finding the vector of the mycoplasm, and a leafhopper is believed to be the culprit. "Although mycoplasm can be destroyed by the chemical tetracycline, and leafhoppers killed by spraying with insecticides, both methods are too costly for large-scale use," and the search is on for more effective and cheaper chemicals and insecticides. In the meantime Jamaica's coconut growers have been advised to destroy immediately any tree that begins to develop yellow spots, the first visible symptoms of the disease, and replant with the Malayan dwarf, the only coconut variety so far known to be resistant to lethal yellowing.—*JOURNAL* of the Agricultural Society of Trinidad and Tobago, June, 1972.

The Schwedler Norway maples near the Cranford Memorial Rose Garden didn't look like this during the past few months, but 1949's winter had heavy snow storms.

THROUGH THE YEARS WITH MISTER BUHLE

His camera recorded the history of the Garden for 58 years

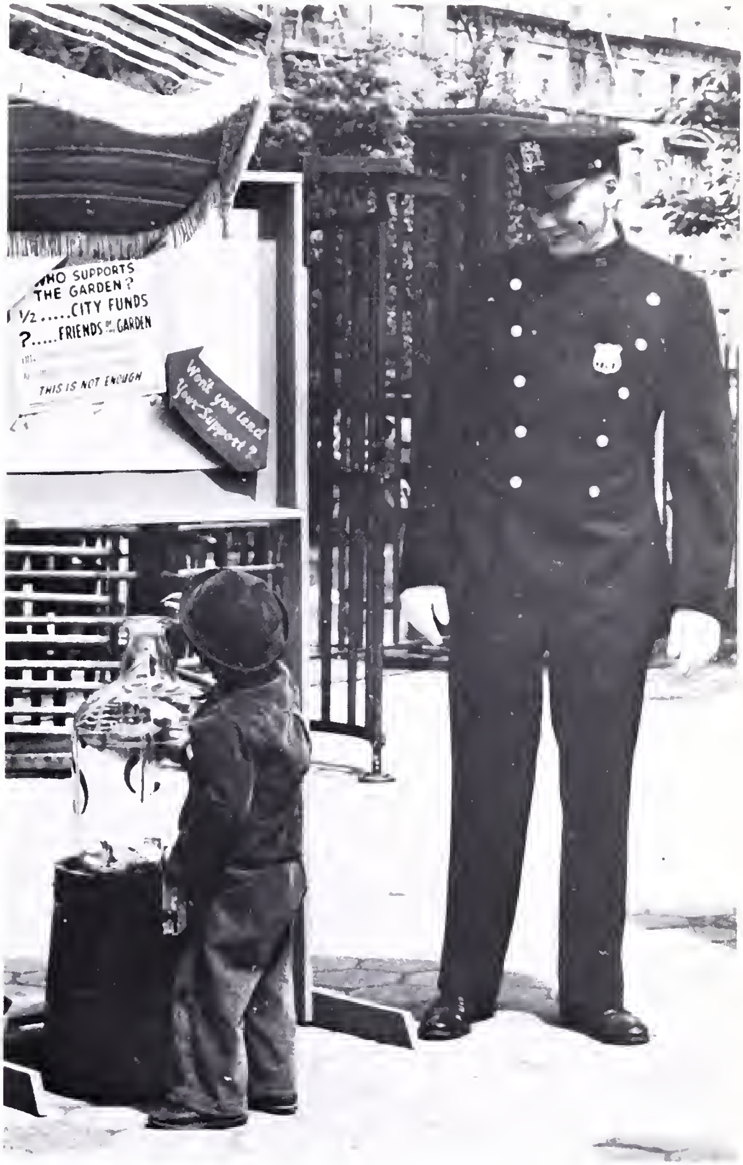
LOUIS BUHLE, Brooklyn Botanic Garden photographer from 1911 to 1969, died on October 6th last year after a brief illness. A fine artist, with a remarkable record of public service, he was responsible for more than 14,000 photographs of the Garden and its plants. A number of them have appeared in PLANTS & GARDENS and its predecessor, *The Record*. Mr. Buhle was also Building Superintendent and for many years oversaw the construction of the Ryoanji Stone Garden replica here and other projects that required a very high degree of precision. In retirement he lived in Maplecrest, New York, where he had spent over thirty years building and rebuilding a mountain retreat, which Director-Emeritus George S. Avery and other close friends fondly called "Buhle's Cathedral."

Mr. Buhle—he was always *Mister* Buhle—recorded the growth of the Botanic Garden from its beginnings as an ash dump to the horticultural showcase it now is. In recent years young staff members were captivated by his reminiscences about the Garden and fellow master-builders who made it grow.

Institutions, like men, are the sum of their experiences, so it is with a special sense of sadness that we note Mr. Buhle's passing. However, artists live on in their work, and Mr. Buhle's photographs will continue to appear in PLANTS & GARDENS for many years. Here are a few of them.

—*Frederick McGourty, Jr.*

Above: This part of the Garden was a rubbish heap in 1910 but 25 years later, when Mr. Buhle photographed it, the scene was already rustic. Beyond the pool, which was man-made, note the fast growth of the willows in that time. Some of these trees have had to be replaced several times because of their short life. *Left:* The waterfall and the wisteria in the Japanese Garden don't look much different today from the time they were photographed in 1926.



At Cherry Blossom time when visitation is at its peak, collection bottles are placed near key entrances. Normally manned by the Garden's active Auxiliary, one of New York City's "finest" pinch-hits at overseeing the contribution of a neighborhood youngster. This photograph was taken in 1948.

(Continued)

Above: Carmine crabapples *(Malus atrosanguinea)* shaped by age, the shade of nearby trees, and finally by the pruning saw, give a Japanese flavor. *Below:* P.S. 129 arrives with its display for the Children's Garden Exhibit in 1915.

To grow the rare, tiny alpine plant jewels to perfection, the best structure is

THE ALPINE HOUSE

Laura Jezik

From Plants Alive, December, 1972

LET'S exmaine some of the options in building an alpine house.

The alpine house should not be too small. How small is too small? This depends on the climate. Small glass houses become hot.

The object of the alpine house is to remain cool and to provide dry, buoyant moving air. Alpines must have perfect air drainage. That is one undisputed rule. The air circulation problem is solved in the design position and exposure of the house on its site. Low roofs contribute to heat build-up. Higher roofs allow heat to rise above the level of the plants.

The house can be built too wide for good air circulation. The average house is 8 to 10 feet wide. This allows an arrangement with a central aisle and benches along both sides.

Some growers add 3 to 4 feet to the width, giving a central bench or table. This gives a maximum width of 12 to 14 feet. Ventilation becomes very difficult if the width is increased.

The length is determined by personal factors: cost, available space, number of plants desired, or other considerations.

Benching Arrangements

Benching and other equipment varies. Plants are usually grown in pots, but there are successful houses in which miniature rock gardens are built and plants set out as in the garden.

When using pots, set them directly on the benching, which can be wood, corrugated galvanized steel, expanded metal mesh or whatever else is desired.

Many growers prefer to lessen the labor of watering a large collection by plunging the pots to their rims in sand. This adds considerable weight and the understructure must be strong enough to carry the load. Remember also that pots which have been watered have taken on additional weight. It is better to use the best materials and be prepared. More than one grower has discovered that his wooden benching has rotted through and his plants have dropped through to the ground.

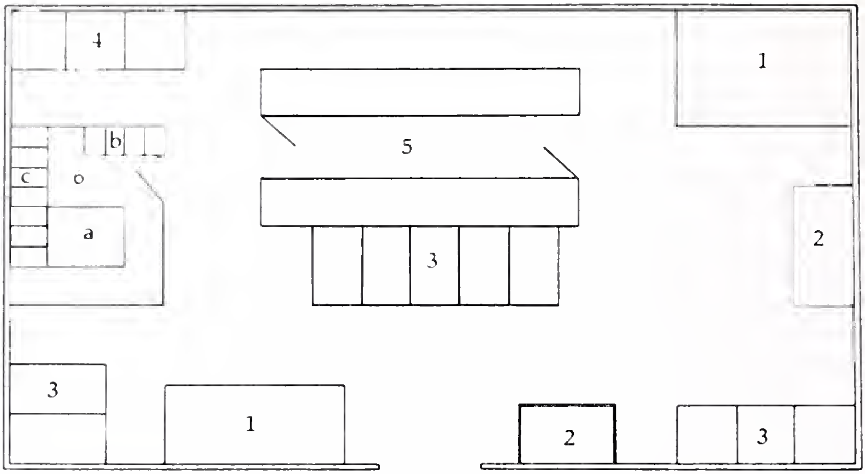
Capillary Watering

One of the most successful growers in England has deep benching made from heavy galvanized iron. They are as deep as his deepest pots which are plunged to their rims in a mixture of silver sand and enough peat so the medium retains its shape when pots are removed. Thus, he can resink his pots without extra labor.

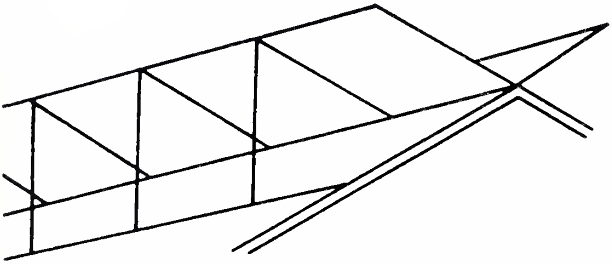
There is real method to his design. He has a watering system which periodically floods the plunge medium for a few minutes. Then drains are opened and the excess is carried off. He has refined his process by varying the depth to which individual plants are plunged in the medium and so can, in one operation and with minimum labor, water his entire collection almost automatically. He can also leave his plants untended for vacations because the medium retains enough moisture to keep them safe for short periods.

Pots: Clay Versus Plastic

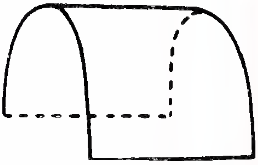
Points for and against clay or plastic are many, but, aside from cost, breakage, and aesthetic considerations, the difference between the two relative to watering is important. If using clay pots, one waters more often, usually giving the pot a tap and the ping or thud tells if it needs water or not. The growing medium can be



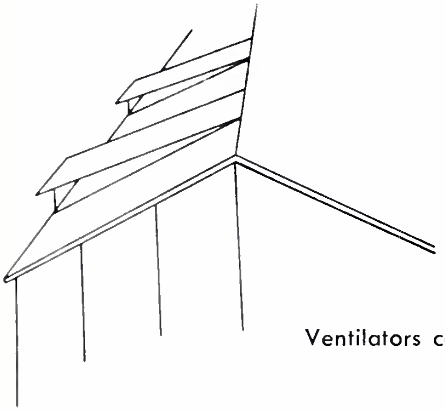
What many of the purists would consider an ideal alpine setup. 1. Plunge beds (shading above), 2. Propagation frames, 3. Frames, 4. Compost piles, 5. Alpine house, 6. Potting shed with: a. Bench, b. Storage bins for mixed soil, c. Storage bins for sand, leaf mold, peat, crushed rock, loam and top dressings.



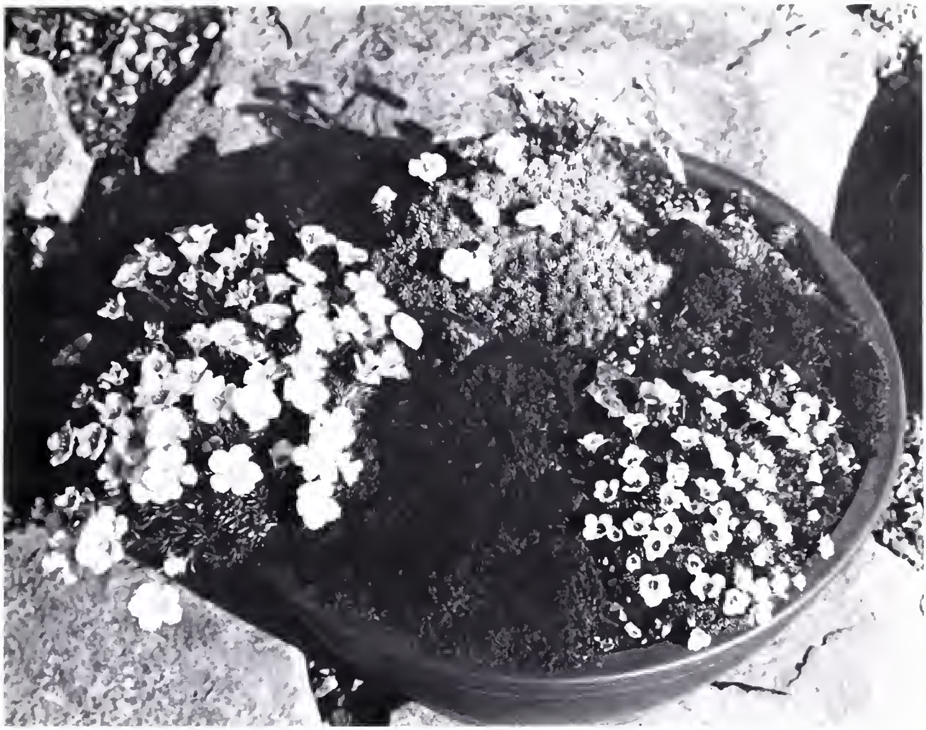
Full ventilation is essential. Here double vents remove warm air fast.



A cloche is a small cage for protecting semi-hardy plants. In the U.S. most are made of fiberglass.



Ventilators continue from peak to eave.



Roger and Joy Spurr

Alpines make good container plants. Lower left:*Saxifraga burseriana magna,* pure white; top: *Saxifraga* 'Falconside,' a hybrid yellow; and lower right: an unnamed pink seedling saxifrage discovered by the author. This container was planted 15 years ago.

rather retentive because clay pots need more frequent watering than do plastic pots. In the latter case, there is no absorption as in clay and watering is needed less often, but the growing mediums must be more open or stagnation can result.

Shading Alpine Houses

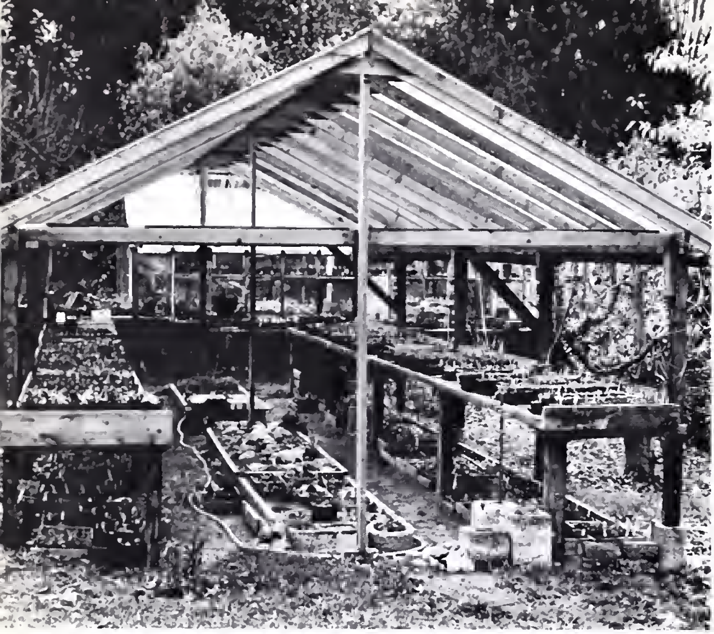
Shading is important. Alpines, generally, cannot tolerate overhead shade such as that of trees. The alpine house is best suited in full sun. This gives a summer shading problem. Lath is an old solution and so are bamboo shades. There are elaborate methods of attaching and operating shades of this sort. There has been experimentation with running sheets of colored water over the roof during summer.

In the past few years, saran and nylon and other synthetic screening has become popular. It is available in several sizes of mesh, but the alpine house grower will probably choose between 40%, 50%, or 60%. One of these should suit his climate.

I would recommend that, whatever shading device is used, it should be kept as high above the plant level as is practical. This is in the interests of coolness. The closer the shading descends to plant level, the warmer the plants will be.

How Open?

A big question is whether the alpine house should be glazed to ground level. The traditional designs had walls to bench level. These were of wood, brick, concrete, stone or other material. The all-glass designs give maximum light; a low-



An alpine shed in the mild, maritime climate of the Pacific Northwest.

Steve Marts

er level of plants can be grown beneath the benching. The traditional, solid wall designs give storage space below the benches, and this space is often given to the growing of shade plants. In severe climates the solid wall model would be preferred because of its greater protection from frost damage.

The ultimate in luxury and convenience is the installation of electronically controlled ventilators, heat, shade and watering. Thus, a thermostat does all the work except potting and occasional weeding. Weeds do appear in the alpine house. Usually they are self-sown seedlings of treasured plants. These delightful bonuses give an added dimension of fun, and are perfect gifts or plant-exchange material.

Wood or Metal?

Whether the house is built of wood or of metal is controversial. Wood requires paint, at least in areas of heavy rainfall. However, one can build one's own wooden alpine house. Glazing in wooden houses is a tedious job, and makes one long for aluminum.

In England one can purchase prefabricated aluminum houses of many types, and the ultimate in ease of assembly are models which are glazed with "glazing clips." No putty or caulking is used. A man and his wife can set up such a house over a weekend and be inside, puttering away before Monday comes.

At this time there is no known American firm which builds prefabricated alpine houses, but small greenhouses are easily converted by adding adequate ventilators. All firms contacted by this writer were very willing to adapt their standard models by adding all the ventilation that would be required. Remember—it is impossible to over-ventilate an alpine house.

If you are interested in delving deeper into the subject of alpines and alpine houses, here are several books which discuss them:

Alpine House Culture for Amateurs, 1951, by Gwendolyn Anley. Country Life, London.

Alpines Without a Garden, 1953, by Lawrence D. Hills. Faber & Faber, London.

Collectors' Alpines, 1964, by Royton E. Heath. W.H. & L. Collingridge Ltd., London.

Rock Gardening, 1968, by H. Lincoln Foster. Houghton Mifflin Co., Boston.

Shrubs for the Rock Garden and Alpine House, 1954, by Royton E. Heath. W. H. & L. Collingridge Ltd., London. ◆

INFORMAL PAVING FOR EASIER GARDENING

M. E. Kitton

From the JOURNAL of the Royal Horticultural Society, May 1972

FORMAL paving has a place in the garden but the subject of this article is something quite different, called, for want of a better name, informal paving. It can be put down almost anywhere, requires the minimum of expertise and effort to construct and can be easily adapted for a wide variety of gardening purposes. Areas round the house are particularly suitable for its use.

Spaces for plants can be left as the work is done and further spaces can easily be made at any time by the removal of a piece of paving which the method of construction readily permits. Plants growing in paving can be most attractive and can be spaced out so when fully grown, as much or as little of the paving as you wish remains in view; the tapestry effects so entertainingly described by Christopher Lloyd can be created without difficulty.

The great merits of informal paving are its relative ease of construction, its almost complete control of weeds, the wide range of gardening uses to which it can be put and the fact that once completed the absolute minimum of work is required for maintenance. It is, of course, permanent and, suitably planted, will be a pleasure to the eye at all seasons of the year.

There are a number of practical points to be mentioned on the construction of informal paving, but basically it consists of spreading plastic sheet on the surface to be covered, laying upon it stones of the type selected (broken paving stone in irregularly shaped pieces is thought to be best), and then brushing over them with an ordinary soft nylon-haired, long-handled broom a dry mortar (made of 2 parts dry soft sand to 1 part of cement well mixed). Make sure that the spaces between the stones are filled. After that all that remains is to wait for rain, making certain that the prepared surface is not walked on in the meantime nor until it has finally set. It will be found that the end result is a hard firm amalgam, capable of standing up to all ordinary conditions.

The ground surface to be covered can consist of almost anything from old cracked concrete paths, full of perennial weeds, to flower beds or grass however weed-ridden. Whatever the surface, it need not be particularly level (unless, of course, it is a path to a main door. For it has been found that the end product with plants growing in it is more attractive on varying levels and undulations although, of course, this does not mean that severe bumps or hollows should not have the sharper changes of level smoothed out. Drainage is no problem because a suitable plant (perhaps a flat-growing dwarf willow) can be planted at any point where water collects, using the hole wherein the plant is set as a soak-away, much to the benefit of the plant.

The area to be tackled is dealt with a bit at a time, so far as the first two processes are concerned; that is to say, a piece of plastic sheet is put down and covered with stone followed by another piece to be covered by stone and so on. The plastic sheeting needs to be of a reasonably heavy gauge so it does not tear easily. Care must be taken to ensure that there is a good overlap on adjoining plastic sheets, even to the extent of seeming to waste some of this material—since its primary purpose is to smother the weeds. Because weeds cannot penetrate the sheeting, a considerable area covered with stone can be accumulated before brushing in the dry mortar, as it is more

Informal paving requires a minimum of skill and can be easily adapted to a wide variety of gardening pursuits.

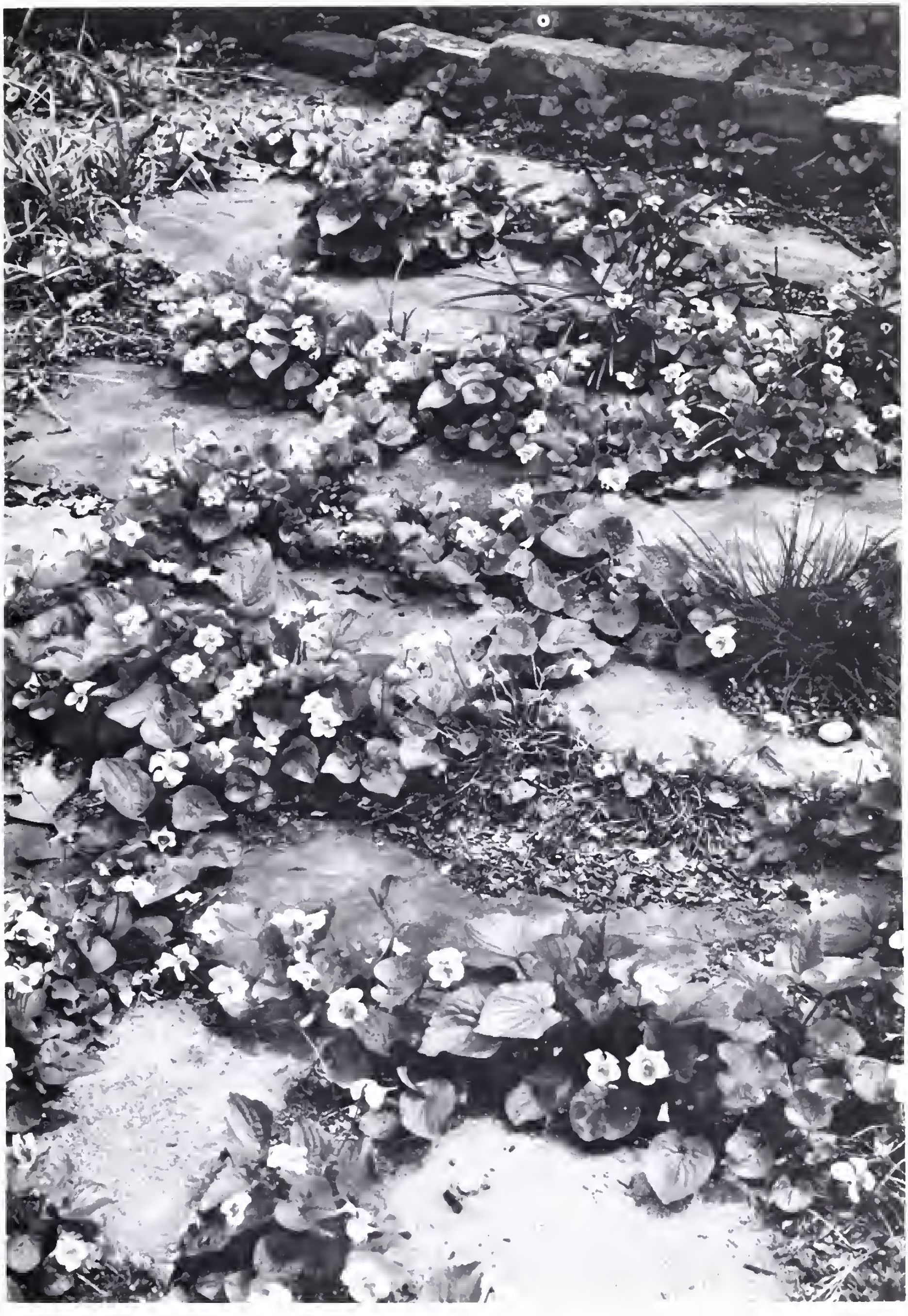
convenient to deal with this process in larger areas.

All sites will differ but, generally speaking, as levels change the contour of the ground can be followed and if one piece of stone is not in exactly the same plane as another or higher or lower than an adjoining piece, it is no harm and enhances the final effect. If a stone tends to rock it is immaterial because the dry mortar, when set, effectively and permanently stops it. Where there is an abrupt change of levels as in a sunken or raised bed (when compared with the surrounding level), the opportunity can be taken to make a "step" and change the level for the area of the bed. If this is done there must be an overlap of both sheeting and stone at the "step," and the upper level at the "step" be given a good overlap over the lower.

Stones can be cut out at any time but it is preferable to have some sort of planting plan at an early stage which can be put into effect before the dry mortar is brushed in: that is to say, after an area has been covered with stone but before the mortar is applied, it is gone over and selected stones for potential planting sites picked out. Because the area is covered with plastic sheeting the removal of a stone does not permit the underlying weeds to come through and the space can be left if desired until the planting stage is reached. It has been found to be preferable, however, temporarily to fill the spaces with sand, both to exclude light and hasten the demise of the weeds and other herbage below and also to ensure that the space is not accidentally filled with dry mortar when brushing in. What stones should be removed and whether for a large or small plant depends on many things and not least upon the preferences of the gardener. Anything from large growing shrubs to diminutive alpines can be satisfactorily planted. This is a subject in itself. But it has been found that planning is helped if the planting holes can be visualized either as singles or in groups to avoid a spotty effect.

How long the paving remains in its completed but unplanted state depends to some extent upon the time of year. The principal consideration must be the certain death of all the weeds beneath the plastic sheeting before a start is made on planting. If the weeds include such as couch grass, a longish wait is worth while. When planting time is decided upon, the spaces are cleared of sand if this has been used and the underlying plastic cut with a sharp knife (it cuts very easily) to the shape of the space and then removed exposing the ground beneath. If the ground is suitable (say the "turf soil" from what was previously a lawn) it can be broken up and used. If unsuitable it should be removed and replaced by whatever mixture appeals to the gardener.

Houses, whether large or small, can be made or marred by the state of the area immediately surrounding them, and although many valuable mechanical and chemical aids are to be had, there is no doubt that a combination of beds and grass requires constant attention to keep clean and presentable. A spell away on business or holiday or a temporary illness can have disastrous effects. It was the result of a combination of these that led to the evolution of my informal paving. After some years no serious snags have been found in the method. ◆



Photographs by Marjorie J. Dietz

The Confederate violet *(Viola priceana)* invaded this informally paved terrace—to the delight of the owners. The author recommends laying paving stones on plastic sheets to prevent unwanted plant growth and seed germination.

SOUTHERN-STYLE VICTUALS

By Jim Wilson

From FLOWER AND GARDEN, August, 1972

THE list of southern vegetables is long and includes some kinds that grow in the North and West as well. You can grow most kinds of southern vegetables from seeds or started plants about as far north as Philadelphia, Detroit, Milwaukee and Omaha. All southern vegetables grow well in California's interior valleys and in warm, low-lying areas of the Southwest. However, they are not generally successful where cool summer nights prevail, in Seattle, Portland and Denver, for example.

Supermarkets all over the U.S. carry a wide choice of southern vegetables from crowder peas through turnip greens. But unless you grow your own you'll never know the anticipation of a taste treat while you are shelling "peas" or stripping the stringy ribs from turnip greens. There's an almost primitive feeling of accomplishment when you have cured and stored a bushel of plump "sweet taters." Here are the major southern vegetables that are simple to grow, even in a wide area outside the South.

Butter Beans. In the South these mean not the fat-seeded limas but the heat resistant, short-podded small-seed types. The pole or climbing type of baby butter bean is the 'Small White' variety, occasionally called 'Sieva' or 'Carolina.' Another climber, stronger-flavored, with brown speckled seeds is 'Florida Butter.' 'Jackson Wonder' is an old-fashioned speckled bush butter bean with a real "whang" in its flavor. Its green seeds yield dark juice when cooked—disconcerting unless you are expecting it.

Do not plant butter bean seeds outdoors until the soil is warm, or the seeds will rot. The usual method with pole types is to make flat-topped "hills" about 6 inches high for good drainage, and 4 feet across. Plant eight to 12 seeds per hill, an inch deep. When the seeds have sprouted, make a strong teepee of canes or poles, 6 feet or more high, tied with stout twine at the apex. Sink the butts deep into the ground to prevent the poles from blowing over when they are burdened with vines. Plant bush varieties in rows; space seeds 2 to 3 inches apart. Butter beans are a little fussy about sprouting; seldom will more than every other seed come up.

You can gain a month on the growing season by starting butter bean seeds indoors in 3-inch peat pots, milk cartons or plastic cups. (Little is gained by starting them indoors in the South, however.) Use light, sandy soil and provide plenty of drainage holes. Start seeds no more than four weeks before the average date of the last frost in spring, because the plants grow fast and become difficult to transplant.

To maintain production, pick butter beans frequently, preferably before pods and seeds get hard. Toward the end of summer, let vines dry off and pick and shell the seeds to dry for storage. After soaking, dried baby limas make excellent soup or butter beans with bacon, ham or side meat, sow belly or hog jowls.

Collard Greens. This blue-green leafy vegetable grows like cabbage but never forms heads. The broad, wavy leaves are sweet from concentrated sugars. Across the South, collards are planted in late summer to get a crop of fall greens. Farther north they can be spring planted. Collard seeds are small—but not the plants. Plant them outdoors ½-inch deep in a "nursery row" and later transplant to stand 2 to 3 feet apart. Begin harvesting leaves when plants are 8 to 12 inches high. Don't take out the center or tip shoot. Freeze surplus young leaves; older leaves develop woody fibers that even determined boiling won't tenderize.

After all the summer vegetables have been harvested, the collard patch stays green, sometimes even as late as Christmas in the deep South. In my day, southern families let little of their collards go to waste. As fast as new leaves appeared they were picked for cooking. If plants grew too fast, the larger, tougher leaves were pulled and fed to pigs or chickens.

Cushaws. This big, green and white-striped crookneck winter squash is not peculiar to the South, but farther north it is replaced by such varieties as 'Hubbard' and 'Butternut.' Too rampant for small gardens, cushaws are relegated to corn fields between rows. As the corn stalks begin to dry, the cushaws take off and send runners all over the field. They may become so thick you have to wait for a light frost to knock them down before you can get into the field. On our farm we buried the 20- to 30-pound fruits in the hayloft to keep them from freezing. All winter we could dig into the hay and retrieve cushaws for cutting into squares for baking with a brown sugar topping.

There's no trick to planting cushaw seeds. The plants fruit more heavily if you work a bushel of rotten manure into each large hill. When the soil has warmed, plant four to six seeds per hill and thin to the two strongest plants. If you have no hayloft, store your cushaws in any warm dry cabinet. They are hard-shelled and keep for months if not washed or bruised.

Hominy. I mean the whole grains, not mill-ground grits. Hominy is made by soaking the large dried seeds of certain varieties of flint corn in a lye solution until the skin sloughs off. Thorough washing then prepares the hominy for table use or canning. Seeds are hard to come by. The roasting-ear variety 'Old Hickory' will suffice if you can't get the real article from southern mail-order seedsmen. Regular field corn hybrids of the dent type won't do; their seeds are made up mostly of soft, floury starch. Grow hominy corn just as you would sweet corn, but allow 16 to 18 inches between the tall, large stalks. Hominy corn needs about 100 warm growing days to mature enough to be snapped, strung and hung to dry in the shuck.

Mustard and Turnip Greens. In the South, fast-growing mustard greens are planted in very early spring and again in late summer—never in midsummer. In the North, however, the planting dates are not so restrictive. Summer-planted greens go to seed fast, so plant only enough for immediate harvest or for freezing. Smooth-leaved varieties are preferred where garden soils are sandy because their leaves are easy to wash. The beautiful curly-leaf mustards are more practical on clay soils that don't blow or splash on leaves. Of course, a mulch of straw would take care of this problem.

Turnip greens have a distinctive, authoritative flavor. On the other hand, young mustard greens are mild, with a slight peppery tang. The two are often blended to make a mess of greens. A southern favorite among turnip varieties is an oddity called 'Seven Top.' It does not form edible roots, but does sprout leaves heavily from its coarse fibrous roots. Northern gardeners generally prefer root turnips such as 'Purple Top White Globe' which yields both greens and tender roots.

In the North, turnips do best if planted in late summer for fall harvest. Early spring plantings produce good greens, but the roots get pithy when weather becomes warm and dry. Turnip tops are not harmed by light frosts. Mature roots may be dug, topped, and stored in a box of moist sand in a cool cellar. This way they will keep all winter. Plant seeds in rows 18 to 24 inches apart; thin plants to stand 3 to 6 inches apart.

Cooking of mustard or turnip greens creates a buttery nectar called "pot likker" which is enhanced in flavor by the bits of bacon, or ham miscellany generally added as flavoring. "Wilted greens" taste much better than they sound. Prepare them by dripping vinegar and sizzling hot bacon juice over a bowl of tender young greens, or greens mixed with leaf lettuce. Eat these as a side dish or salad quickly before the bacon drippings get cold.

Okra or Gumbo. This curious vegetable bears its edible pods upright in the axils where its broad, rough leaves join the upright, woody main stem. Cut the pods when they are less than 3 inches long. Bigger than that they are likely to be woody. In the South plants grow head high, but in the North only 3 feet or so unless summers are unseasonably warm. Good crops of okra are harvested from the dwarf variety 'Long Pod Green' as far north as Utica, N.Y.

You can prepare gumbo in many ways. Southern style includes baby okra pods steamed in butter, dipped in cornmeal and egg batter and fried, or chopped for adding to shrimp or crayfish gumbo and soup stock. But you have to harvest it first, and both plants and pods of okra are a mite prickly. My mother used to don wash dress, sunbonnet and old stockings pulled over her arms before she went out to cut okra. Okra won't wait. You either harvest it every two or three days or the pods quickly get large and woody.

The seeds do not sprout well in cool soil. Wait until summer has surely arrived before planting seeds outdoors. You can also start okra early indoors as described for butter beans. We always soaked the seeds overnight in warm water before planting. Plants grow robustly, so thin them to stand 4 feet apart. You need six to 12 plants for an average family; surplus can be frozen.

Peas. In the South these are not green peas or "English" peas, but are the "Southern peas" that more closely resemble bush beans. "Cow-peas" is another name for them, owing to the relish with which cattle eat the protein-rich vines. You have probably seen the dried black-eyed peas in the grocery—which are good when properly cooked. But they can't hold a candle to the flavor of freshly shelled blackeyes. Dried blackeyes are cooked with hogshead in a traditional New Year's Day southern dish to bring good luck in the coming year.

Other southern peas are "crowders" (so named for their habit of crowding pods with squared-off seeds), "lady peas," "cream peas," "whipporwills," "clay peas," and the like. Years ago there were hundreds of local varieties grown from home-saved seeds, but now a few newer disease-resistant varieties dominate the selection in seed stores and catalogs.

I once tried growing crowder peas in Detroit, and got magnificent vines but only a few pods late in the season. One of the earlier blackeye varieties would probably mature there, given a reasonably warm summer. It would also help to inoculate the seeds with nitrogen-fixing bacteria such as "LegumeAid" or "Nitragen." In the North you may have to use dried edible blackeye peas from the grocery for seed, as seed racks rarely carry them north of Tennessee or Virginia.

A 20-foot row of southern peas is enough for most families; 60 feet would give plenty for freezing a few cartons of shelled peas and tender young snapped pods.

Sweet Potatoes. Ever since Colonial days, a "tater" patch has been essential to all southern gardens. During the many periods of southern hard times, sweet potatoes supplemented with greens, salt meat, catfish and occasionally an over-age laying hen kept many families well nourished. Plowed out in early fall, cured in a warm dry storeroom, sweet "taters" would keep through winter until time for spring garden produce.

You can get good sweet potatoes in the grocery but it is easy and fun to grow your own. They need a fair amount of space; light, sandy soil without much manure or compost. Grow your own "slips" by quartering small potatoes, allowing the cut surface to dry a day or two, and planting them in a flat of soil indoors. Don't use potatoes that have been chemically treated to retard sprouting. Numerous rooted shoots with short runners should form within a month. Pull these off the mother section for replanting in the row.

A popular way to plant sweet potatoes is to build up a broad bed raised about 12 inches for good drainage. Make it 3 to 4 feet across, and plant two rows of shoots down its length, 12 inches apart. Water them well a few days to help them become established. A row 20 feet long will yield enough to make your work worthwhile. ◆

New developments in the

OSAGE-ORANGE

Joseph C. McDaniel

OSAGE-ORANGE (*Maclura pomifera*) had its greatest use in the 19th century as a rugged hedge plant. Particularly in the midwestern United States we still see remnants of the former living fences planted before the advent of barbed wire on otherwise nearly treeless cornbelt farms. An occasional farmer still prunes an isolated tree or a section of old hedge, but mainly the trees are left untouched. They furnish a good shelter for wildlife, and squirrels eat the seeds of the large "hedgeapple" fruits, as they are usually called in Illinois.

The fruits, together with the thorns that helped make it an animal-proof hedge, have discouraged use of the Osage-orange in modern landscaping. Otherwise, the tree has much to recommend it. It is hardy to —20° F., grows in most soils including very heavy clays where few other trees can be established, and develops into a picturesque specimen seldom injured by fungi, insects or animal predators.

If only we could eliminate the unwanted fruits and the thorns! It now seems we can, in grafted or cutting-grown trees, just as happened earlier with cultivars of honey locust (*Gleditsia triacanthos*). Some, although apparently a minority of the dioecious Osage-orange seedlings, are staminate (male), and vegetative propagation will increase these readily.

Thorns, too, are eliminated, if propagation comes from scions or cuttings taken high enough in an old tree, where the twigs are thornless. I have rooted both hardwood and softwood cuttings from such sources.

Albert B. Ferguson, at an Iowa nursery, grafted scions from a staminate tree selected for its upright branching habit. Part of the propagated trees have remained thornless for as long as three years; part initially developed a few short thorns but are expected soon to be completely thornless. Root pieces, however, yielded trees that immediately became very thorny. It appears that *M. pomifera inermis*, so-called, is not a true botanical variety, but any tree of the typical species grown sufficiently mature to have passed the thorny stage, except for basal branches.

In park or other plantings, where the large decorative "oranges" are tolerated, fruiting cultivars in variety are possible. Some trees have fruits bigger than an average grapefruit. One in a hedge row in my county has them much smaller and seedless. But for shade tree or even topiary use, the preferred thornless cultivars will generally be staminate selections. ◆

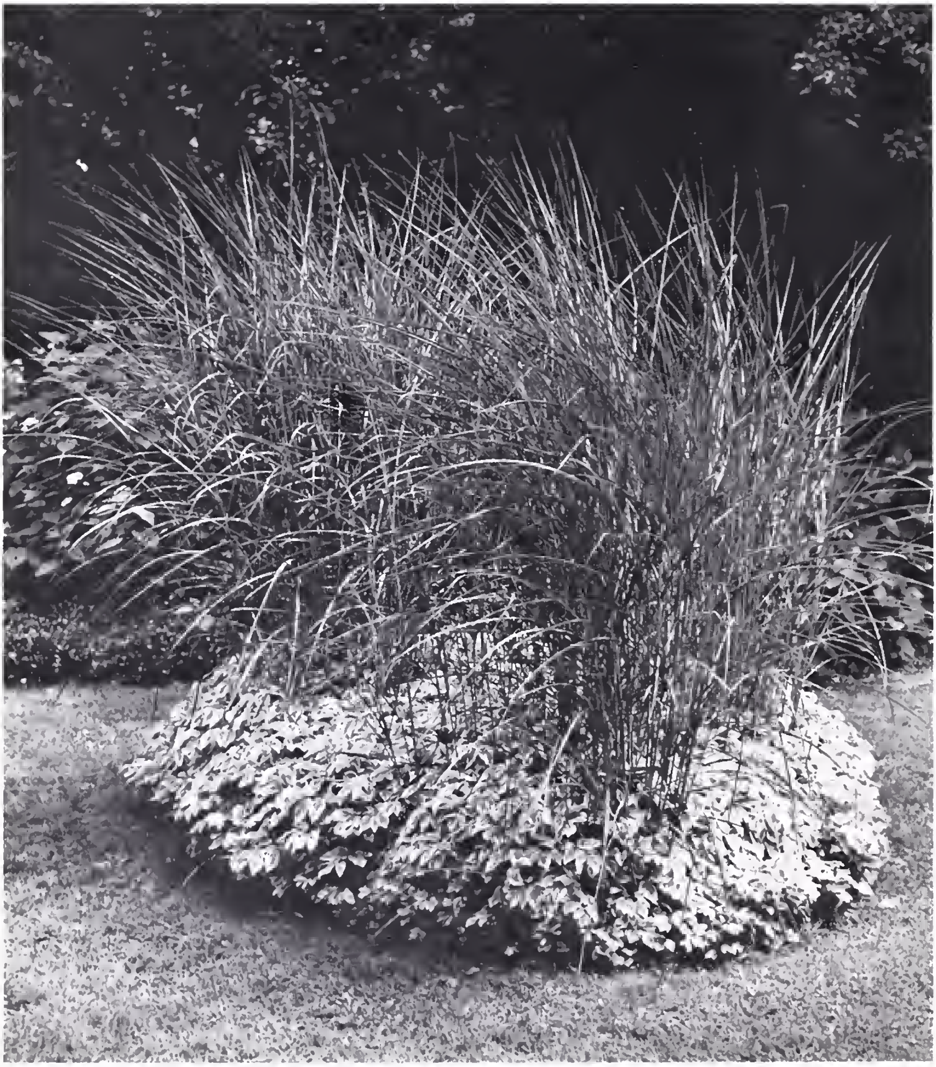
Joseph C. McDaniel

New look in Osage-orange: A thornless tree results when cuttings or grafts come from high-up thornless twigs.

ORNAMENTAL GRASSES

For stately and distinctive character, for autumn garden interest, for ease of maintenance and for variety

Mary Hockenberry



A variegated form of eulalia grass (*Miscanthus sinensis*) rises from an under-planting of variegated goutweed (*Aegopodium podograria*) in a Vermont garden.

ALTHOUGH European gardeners have long been aware of the advantages of the ornamental grasses, most Americans have yet to realize their potential. Over 80 types of annual and perennial ornamental grasses can easily be grown in the United States, in the annual garden or as perennial landscape plants. They require little maintenance and tolerate a wide range of soil and site conditions. Of the recommended grasses, over 40 are perennials hardy as far north as Ithaca, New York.

One of the main features of the grasses is their showy flowers, which are usually borne in autumn, when few other plants have garden interest. The annuals, although showy when in bloom, are used primarily as cut flowers in fresh and dried arrangements. The perennials, even when grown in the North, range in height from 6 inches to 9 feet, and have unlimited possibilities for landscape use due to their foliage texture, color and overall form.

One of the most popular grasses, often planted in southwestern United States, is pampas grass (*Cortaderia selloana*). This clump-forming plant, which grows as tall as 20 feet, is called the "queen of the ornamental grasses" because of its large plumy flowers. Although this type will grow and may flower in the North, it is treated as an annual north of Washington, D.C. In milder climates it is a perennial.

Among the lower-growing perennial grasses is dwarf blue fescue (*Festuca ovina* 'Glauca'), which grows in tufts less than 8 inches tall. Its striking silvery-blue foliage is retained year-round and plants are most effective when used as a ground cover, at the edge of a border, or in the rock garden. Another evergreen with blue-gray foliage is blue oat grass (*Helictotrichon sempervirens*), which forms a 2-foot tall pyramidal mound. It is usually listed in the nursery trade under a synonym, *Avena sempervirens*. Blue foliage grasses are most attractive when used with plants that have dark red or purplish foliage, like *Ajuga reptans* 'Atropurpurea' or *Berberis thunbergii* 'Crimson Pygmy.'

Two grasses ideal for shady locations are the northern sea oats (*Uniola latifolia*) and bottle-brush grass (*Hystrix patula*). These medium-sized plants, 4 feet tall, form clumps of foliage followed by showy flowers in late summer and autumn. Northern sea oats is noted for its upright, arching growth habit and its rich bronze autumn and winter coloration. Bottle-brush grass has long spikes of flowers that resemble bottle brushes, hence its common name.

Several of the most attractive ornamental grasses belong to the genus *Miscanthus*, or eulalia grass. They are 5 to 8 feet tall, and bloom in late summer and autumn. Some of the variants include maiden grass, (*M. sinensis* 'Gracillimus,' a shorter, narrow-leaved type; 'Zebrinus,' known as zebra grass, a striking plant with leaves banded with yellow; and *M. s.* 'Variegatus,' or variegated eulalia, which has leaves that are longitudinally striped white and green. The variegated types are excellent specimen plants, and all eulalias are attractive as background plants in the perennial border.

One of the most beautiful and striking grasses is *Erianthus ravennae*, plume grass, which in mild climates can easily reach 15 feet in one season. Here in Ithaca, it grows up to 9 feet. Of stately and graceful form, it develops a 4-foot mound of basal leaves from which the tall flowering culms arise. Plume grass can easily become the focal point of a garden when it is in bloom in late summer.

No discussion of the ornamental grasses would be complete without mention of the genus *Pennisetum*. *P. alopecuroides*, fountain grass, is a winter-hardy perennial which eventually becomes a 4-foot mound of fountain-like leaves with bronze spike-like flowers that appear in late summer. Fountain grass remains attractive in the autumn and early winter because of its yellow fall color and persistent silhouette in the landscape.

Pennisetum ruppelii, often called *P. setaceum* and hopelessly confused with *P.*

Appropriate for its majestic background are these two clumps of pampas grass (*Cortaderia selloana*) in a California garden.

Photographs by George Taloumis

alopecuroides has narrower foliage with longer, more purple spikes that are beautiful in late September. *Pennisetum ruppelii*, commonly known as the crimson fountain grass, is a showy annual north of Washington, D.C. In the South it is a perennial. Both of the fountain grasses make excellent specimen plants or can even be used in the shrub border.

Very few grasses with ornamental qualities spread rampantly by underground rhizomes or stolons. Most form clumps that increase slowly in size. They should be divided about every five years for healthy and vigorous growth. Most of the grasses grow well in a sunny location with ordinary soil and natural rainfall. The perennials are propagated by division and the annuals are grown from seed each year. The only maintenance that is required occurs in the early spring, when the perennials should be cut back to the ground, as they grow entirely from the base each year.

To prove that these ornamentals can grow and flourish where other plants have difficulty, six types of grasses were recently tested in a practical situation. Last spring we planted 325 plants in four areas of a municipal parking lot in downtown Ithaca. Despite adverse growing conditions due to automobile fumes, excessive litter, and constant abuse from dogs and careless pedestrians, all but two plants thrived. These plants received a minimum of care throughout the growing season and rainfall was the only source of moisture.

The flowers of the annual grasses and many of the perennial types are sold in florist shops in dried fall and winter arrangements. Very often these flowers are dyed bright colors and sold in boutiques, department stores and garden centers.

Ornamental Grass Dealers

George W. Park Seed Co., Greenwood, South Carolina 29646

Thompson & Morgan, Seedsmen, London Road, Ipswich, Suffolk, England

Bluemont Nurseries, Inc., Blue Mount Road, Box 219 Rt. 2, Monkton, Maryland 21111 (Does not ship)

The Wild Garden, 8243 N.E. 119th, Kirkland, Washington 98033 (catalog $1.00)

Hillier & Sons, Winchester, England

Sunnybrook Farms Nursery, 9448 Mayfield Road, Chesterland, Ohio 44026

Kurt Bluemel, Inc., Hess Road, P.O. Box 236, RFD #2, Fallston, Maryland 21047 (Does not ship)

Wayside Gardens, Mentor, Ohio 44060 (catalog $2.00)

The Plantsmen, Buckshaw Gardens, Holwell, Sherborn, Dorset, England

Martin Viette Nurseries, Northern Boulevard, Rte. 25A, East Norwich, N. Y. 11732 (Does not ship)

A SIMPLE FRAME FOR SOFTWOOD PROPAGATION

Alfred J. Fordham

From Arnoldia, July, 1972

At the Arnold Arboretum's Dana Greenhouses the propagation of woody plant cuttings is carried out largely under polyethylene plastic, except during summer when intermittent mist is employed. The structures and system presently in use have reached a high degree of efficiency due to testing of new ideas and adoption of improvements seen elsewhere.

With the advent of polyethylene, a great deal of the finicky care previously required to root cuttings has become unnecessary. The plastic material is air permeable, yet vaporproof; this permits a high relative humidity to be maintained, and by reducing transpiration prevents the cuttings from wilting.

By modifying and adapting certain components of the Arboretum's carefully controlled system, amateurs can propagate cuttings easily that previously were considered difficult. The ensuing device is a simply constructed polyethylene propagating chamber (made from a standard 1- by 2-foot greenhouse flat) which may be placed outdoors and left for weeks on end without attention.

It is well to gather softwood cuttings early in the morning—for at this time they are in their freshest condition. Only wood of normal growth should be chosen. Immediately on collection, the cuttings are placed in polyethylene bags which are tightly sealed with rubber bands. The bags are not squeezed to exclude air and this permits packing them on top of one another without crushing the contents.

To prevent a buildup of heat within the bag, it must be shielded from the sun. At the Arnold Arboretum we put cuttings into styrofoam or picnic-type coolers and this has proven highly satisfactory. In the event that the cuttings cannot be processed immediately after collection, they will remain fresh for a week or two if stored in a refrigerator at 40 degrees.

Making the Cuttings

The leaves are removed from the part of the cutting which will be below the medium, and a slanting cut is made below the node or nodes (the place on the stem which normally bears a leaf or leaves). If the tip of the cutting is soft and rubbery, it too is removed as it could decompose, thereby inviting fungus infection.

A number of root-inducing substances may be employed. Hormodin #2 or Hormo-Root "B" are used on most softwood cuttings; Hormodin #3 or Hormo-Root "C" would be needed for the more difficult subjects such as Ghent azaleas, stewartias, and so forth.

To prevent contamination, one should work with a small amount of the root-inducing material on a piece of paper rather than dip the cuttings directly into the supply container.

Softwood cuttings are generally moist enough so that it is unnecessary to wet them before applying the auxin. The bases of the cuttings are dipped into the powder just deeply enough to cover the newly-cut surfaces.

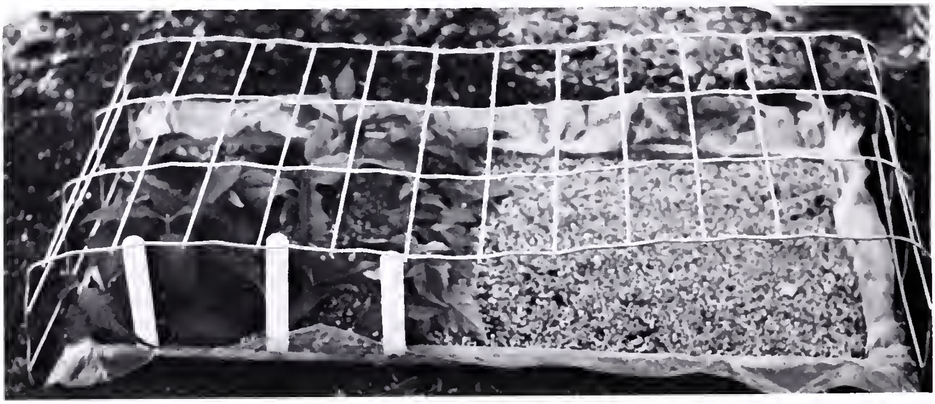
Insertion of Cuttings

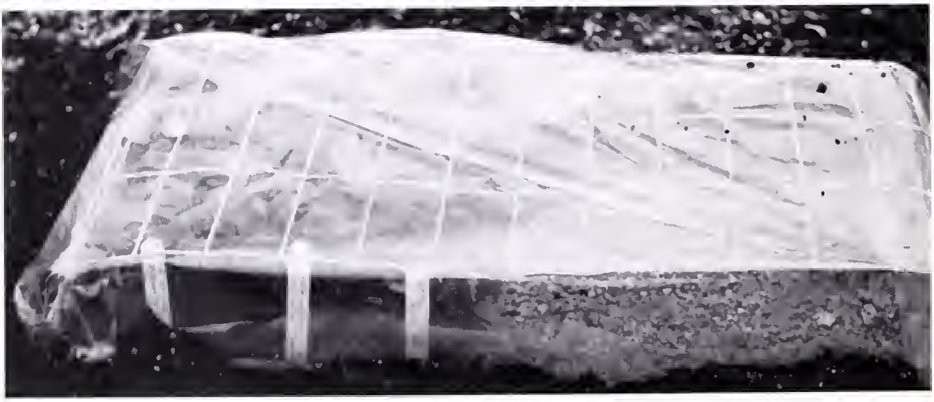
The cuttings are now inserted in the medium after a hole is made for each large enough to receive it without brushing off the root-inducing material. The cuttings should not be overcrowded. Enough interspace should be left so that air can circulate around the cuttings and light can reach the medium. This sanitary measure aids in preventing problems with diseases.

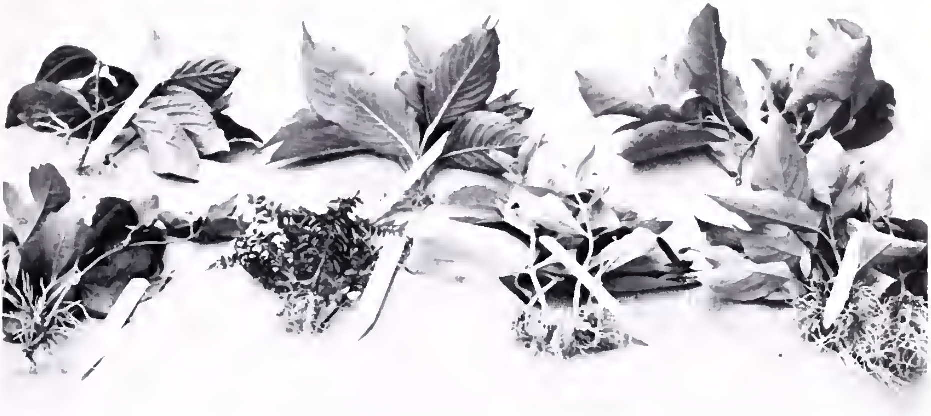
Next the cuttings are watered. This serves two purposes: first, it compacts the

Above: The site of the outdoor propagating box should be out of direct sunshine. The flat is pressed against the earth to show its outline, then the soil is removed so the flat's edges are level with surrounding surface. Next, 2-mil polyethylene is cut to line flat with surplus of 6 inches on all sides.

Below: Cuttings inserted in flat under frame of utility wire. Final step is stretching polyethylene over wire about 6 inches above cuttings.







Alfred J. Fordham

An assortment of softwood cuttings after they had rooted in the frame. They include shrubby dogwood, viburnum, magnolia, buddleia, weigela, pachistima.

medium around the cuttings, and secondly, it provides the initial watering.

The framework is put in place and covered with the polyethylene; soil is then mounded over the plastic where it meets the ground. It should be emphasized that with this system of propagation it is imperative that all air leaks be eliminated as they could reduce the very necessary high humidity and cause failure.

After Care of the Propagating Case

After initial watering, it is unlikely that any further moisture will be needed. It would be wise, however, to check the cuttings each week or so to make sure that fungus infection is not occurring, or that insects are not present which have hatched from unnoticed egg masses.

Inspections can be made through the transparent polyethylene without its removal. It is unusual for problems to arise through the activity of fungi; however, in the event that this does occur, the covering should be lifted and infected cuttings disposed of. The remainder may then be sprayed with an application of 50% Captan at the rate of 2 teaspoons in a gallon of water.

Tests for Rooting

After several weeks, the cuttings are checked for rooting. This is accomplished by grasping each with thumb and forefinger. A gentle upward tug will show whether the cutting has rooted. Heavy resistance indicates an extensive root system; slight resistance, either a heavy callous or small roots; no resistance, the absence or roots altogether.

Potting or Boxing

Once the cuttings are sufficiently rooted, they are carefully lifted from the medium and immediately potted or boxed. Material rooted under conditions of high humidity and temperature must be brought into normal atmosphere gradually. This is accomplished by again covering them with polyethylene.

On cloudy, humid days the plastic can be removed; and if several such days occur in succession, the transition will be complete. Otherwise, uncovering the cuttings at night and recovering them during the heat of the day for a period of five or six days will accomplish this very necessary conditioning. ◆

What you need to know about . . .

MYCOPLASMAS

Malcolm C. Shurtleff

From Grounds Maintenance, June, 1972

ALTHOUGH mycoplasmas have been known to cause disease in humans and animals for a number of years, the first plant-infecting agent was reported in 1968. In the last four years, some 60 diseases, previously thought to be produced by 'yellows' or 'witches-broom'-type viruses, have been implicated or proven to be caused by organisms known as mycoplasmas.

These peculiar, free-living, one-celled bodies are the smallest and simplest known organisms that can be grown on certain types of laboratory culture media free of living tissue. Mycoplasmas are perhaps more closely related to bacteria than to other disease-causing agents.

The mycoplasmas discovered in plants lack the rigid cell walls of bacteria, fungi, higher plants or animals and are delimited or bounded by at least three very thin membranes. Being fragile, soft and pliable, they assume a wide variety of sizes and shapes—from round or oval bodies 45 to 800 millimicrons ($m\mu$) in diameter, to branched, fungus-like forms up to a micron long. (One micron is equal to 39.37 millionths of an inch).

These fungus-like forms divide or break up to form tiny, round, reproductive cells called elementary bodies. Plant-infecting mycoplasmas are smaller than bacteria and are within the size range of large viruses. They pass through bacterial filters and can be seen only with the electron microscope.

Mycoplasmas reproduce by budding (like the yeasts), or divide to form 'daughter' cells (like bacteria). In nature, they are transmitted from plant to plant by leafhopper insects. Man transmits them when taking cuttings and divisions from diseased plants, grafting, or by other means of vegetative propagation. Dodder plants can also transmit mycoplasmas from an infected to a healthy plant.

Mycoplasmas have been found not only in the diseased plant, but also in the leafhopper vector. There is good evidence that these agents can multiply in leafhoppers as well as in diseased plants, and in the future we will probably discover more leafhopper-transmitted viruses to be caused by mycoplasmas, since this is currently an active field of research.

The closest known organism to the mycoplasma, recently shown to cause aster yellows in over 300 species of plants (some of these are cited in Table 1), is one producing certain types of pleuopneumonia in animals. This discovery has led researchers to treat diseased plants with antibiotic drugs—many of the ones used to treat a type of pneumonia in man.

A number of these drugs, including tetracycline, methacycline, chlortetracycline, oxytetracycline, chloramphenicol, sulfadiamine, sulfisomidine, and sulfisoxaziole, are effective in 'curing' aster yellows and other mycoplasma-caused diseases in plants.

Infected plants, when treated with an effective antibiotic, produce 'healthy' leaves and flowers. However, when antibiotic sprays, dips or soil drenches are stopped, disease symptoms reappear in several weeks. So current chemical methods of control used by the researcher and aimed at 'killing' the mycoplasma within an infected plant, are not yet practical for the groundsman.

A few of the plant diseases besides aster yellows now thought to be caused by mycoplasmas include corn stunt, mulberry dwarf, phloem necrosis of elm, pear decline, rubbery wood and chat fruit of apple, Pierce's disease or grape decline, green petal disease of strawberry, several stone fruit diseases (X-disease, peach yellows, little-peach, little-cherry), as well as purple-top, spindle tuber and witches-broom of potato.

Much more research needs to be done in culturing and inoculating plants with mycoplasmas before direct proof that they are the sole agent of disease can be established in every instance where this type of organism is presently suspect. So far, proof that mycoplasmas cause disease in plants is largely based on two factors: (1) symptoms within an infected plant, and the presence of mycoplasma in diseased plants but not in healthy ones; and (2) absence of mycoplasma in the phloem of artifically-inoculated plants that have recovered from disease following treatment with tetracycline, an antibiotic effective against many types of bacteria, but not against viruses.

To understand a mycoplasma, the symptoms it can produce, a disease cycle, how it is transmitted, and controls, we will discuss the aster yellows disease.

Aster Yellows

Aster yellows is one of the most widespread diseases of plants, and the host range extends from Allium to China-aster, thus spanning most of the evolutionary range of the seed plants.

Aster yellows is one of the chief limiting factors in the growing of China-asters. It is not uncommon to find 90 per cent of the plants affected. Although such plants may not die, they seldom produce marketable flowers or viable seed.

The disease is common and destructive in most parts of the world where the air temperatures do not persist much above 90 degrees F. High temperatures probably inactivate the mycoplasma in plants, as well as in the leafhopper vectors.

The chief vector of the eastern strain of the mycoplasma in the United States is the six-spotted or gray aster leafhopper, although 16 or more other species of leafhoppers are known to transmit the western or California strain.

The first symptom on a young China-aster is a slight yellowing or clearing of the veins in the whole or part of a single young leaf. This is followed by a general chlorosis (yellowing to almost whitening) of the new leaves. A sector of an affected plant may be chlorotic for some time before the remaining portion is affected.

The disease causes chlorosis in all green parts of the plant, and the flower petals, which normally contain no chlorophyll, frequently become quite green (virescent) and distorted. Another striking symptom is the production of long, thin, stiff, yellowish secondary shoots. These frequently arise in the axils of mature leaves showing a normal green color.

Other affected plants are typically stunted or dwarfed and mildly to severely chlorotic, producing short to tall, upright secondary shoots. Leaves on such plants frequently differ in size and shape from normal plants. Flowers may be greenish, dwarfed, aborted or absent. Trichomes (hairs) on diseased flowers frequently develop into leaf-like structures.

Disease Cycle

The mycoplasma is perpetuated in infected perennial crops and weeds; various annual weed and crop plants growing in the greenhouse; in bulbs, corms, tubers, and other plant parts used for propagation. A few of the perennial weeds that retain the yellows agent from one season to another are listed in Table 1 on page 54.

The mycoplasma also over-winters in its leafhopper vectors, especially in mild climates. Mycoplasma-carrying insects may travel a thousand miles or more northward in the spring and early summer on southerly winds, and be distributed over wide geographic areas. The mycoplasma may also be picked up from perennial hosts as the leafhoppers migrate into fields and gardens. The six-spotted leafhopper may over-winter in the north in the egg stage on cereals and grasses. Some of the eggs hatch in the spring, so that by midsummer a large number of adults is present. As soon as cereals begin to ripen or grass is mowed.

Table 1. A few of the more important plants susceptible to aster yellows

Ornamentals		Vegetables	Weeds and Field Crops
Amaranthus spp.	Gloxinia	Broccoli	Barley
Anemone	Golden-glow	Cabbage	Bidens
Babysbreath	Goldentuft	Carrot	Buckwheat
Begonia	Hydrangea	Cauliflower	Carrot, wild
Black-eyed Susan	Marigolds	Celery	Chicory, wild
Buttercup	Nasturtium	Chicory	Cinquefoil, rough
Calceolaria	Pansy	Cucumber	Daisies
Calendula	Periwinkle	Dill	Dandelion
California poppy	Petunia	Endive, Escarole	Fieldcress, yellow
Campanula	Phlox	Lettuce	Fleabane, daisy
Chrysanthemum spp.	Pink, dwarf	Mustard	Goatsbeard
Cineraria	Poppy	New Zealand spinach	Grasses, wild
Coreopsis	Primrose	Onion	Horseweed
Cosmos	Safflower	Parsley	Lettuce, wild
Delphinium	Salvia	Parsnip	Milkweeds
English daisy	Scabiosa	Potato	Mullein
Erigeron spp.	Strawflower	Pumpkin	Plantains
Forget-me-not	Sunflower	Radish	Purslane
Gaillardia	Violet	Spinach	Ragweeds
Gladiolus	Zinnia spp.	Tomato	Thistles

the leafhoppers migrate in great numbers to nearby plants. If these should be some early flower or vegetable, they will later move again to an adjacent crop.

Transmission

The mycoplasma must incubate within both nymphs and adult leafhoppers for approximately 9 to 16 days before these insects are capable of transmitting it. The length of the incubation period is determined partially by temperature, with an average of 12 days required at 77° F., 11 days at 86° F., and 16 days at 68° F.

Since this period is usually longer than the nymphal life of the leafhopper, it follows that nymphs are unable to transmit the mycoplasma, although they are able to take it into their bodies by feeding on a diseased plant. However, adult leafhoppers arising from these nymphs can transmit the mycoplasma to a healthy susceptible plant without further access to a source of the micoplasma.

The adult insect is usually able to transmit the agent as long as it lives (up to 100 days or more; average about 65 days). Newly-hatched leafhoppers, even those from parents that carry the mycoplasma, are invariably mycoplasma-free. They cannot spread the agent—and hence the disease—until they have obtained the mycoplasma from an infected plant and the necessary 9 to 16 day incubation period has elapsed.

The mycoplasma also has an incubation period in China-aster and other host plants, varying from 9 to 40 days or longer and depending on the age of the plant and the temperature. No infection occurs at 50° F. or 86° F.; the requirements being 18 days at 68° F. and 9 days at 77° F. During this period the mycoplasma becomes systemic and increases in concentration to the point where symptoms appear and leafhoppers can acquire the agent during feeding.

Once a plant becomes infected, it ordinarily remains so for life. It is not uncommon for the yellows disease to be abundant in one species of flower while another potentially susceptible species nearby is free of disease. This may be explained in part by the feeding preference of the leafhopper for one host plant as compared to another.

The amount of disease is not always correlated with the leafhopper population in gardens or beds. Important considerations in determining disease incidence are the relative abundance and kind of virus reservoir (infected plants), temperature, and other climatic conditions affecting mycoplasma, host and the leafhoppers, including their mobility.

The mycoplasma in both infected plants and insects may be inactivated with heat. Living leafhoppers can be freed of mycoplasma by keeping them at 88°F. for 12 days. The mycoplasma is completely destroyed in living plants if they are kept at 100 to 108°F. for two to three weeks. High summer temperatures, particularly in the southwest and parts of the midwest, play an important part in keeping down the incidence of aster yellows.

Most, but not all, mycoplasma activity is destroyed in leafhoppers when they are held at 88 to 90°F. for a day or longer. The insects are more sensitive to heat than the host plants, because they are much smaller and more quickly warmed to the temperature of the air. After a few days of hot weather, a drop in temperature may restore the mycoplasma infectivity in the insects.

However, the mycoplasma needs an incubation period, ranging from a few hours to two weeks, to again reach the original infective level. When the hot spell lasts for two weeks or more, the mycoplasma is destroyed or is no longer infective and the leafhoppers are 'free.' To become infective again they must feed on a diseased plant to pick up fresh mycoplasma.

The aster yellows agent has been transferred by needle inoculations through ten colonies of non-infective aster leafhoppers. It is estimated that the original inoculum was diluted about 1 to 10,000 at each transfer, and that the mycoplasma present in the ninth and tenth serial transfers, if no multiplication had occurred, would have been diluted to 10^{-36} and 10^{-40}, or many billions of times. But the infectivity—and presumably the concentration of the mycoplasma—at the ninth transfer was as high as in the juice of the first transfer. This constitutes direct proof that the mycoplasma multiplies in the aster leafhopper.

The aster yellows mycoplasma is injected into the phloem cells of China-aster and other plants in the saliva which the leafhopper secretes during feeding. The mycoplasma is then translocated within the plant in the phloem. In advanced stages, the mycoplasma is systemic in above-ground portions of the plant.

Control

Aster yellows is difficult to control because of its wide host range and the prevalence of its leafhopper carriers on many crop and weed hosts, but China-asters, and certain other highly-susceptible flowers are often grown to maturity under fine cheesecloth or tobacco shade cloth (22 by 22 threads per inch) or wire screening (18-mesh to the inch) to keep out leafhoppers. Cloth or wire fences 6 feet high built around China-aster beds reduce the amount of infection about 50 per cent, but are not as effective as when plant beds are completely covered.

Where feasible, all susceptible perennial and biennial weeds along roadways, ditch bands, fence rows, around greenhouses and plant beds and in pastures should be eliminated. Susceptible crops should not be planted adjacent to yellows-affected or yellows-susceptible crops.

Applications of quick-killing, contact insecticides are sometimes effective in eliminating or controlling leafhoppers. Applications as frequent as 1 or 2 a week may be necessary during heavy leafhopper-migratory periods. Susceptible weeds growing near flowers should also be killed early to reduce the number of migrating leafhoppers. Near-perfect leafhopper control must be achieved, for a leafhopper may transmit the mycoplasma before it is killed by the insecticide.

Flowers and other crops planted late in areas where summer temperatures are commonly in the 90's or above often entirely escape aster yellows, probably the result of high temperatures destroying the myeloplasma in leafhoppers.

◆

LEMON-VERBENA

Elizabeth Remsen Van Brunt

George Taloumis

Lemon-verbena and rose geranium *(at left)* scent a summer terrace with the distinctive aromas of their foliage. Lemon-verbena must be wintered indoors in the North. In mild climates it can become a shrub 8 or more feet tall. Indoors the plants benefit from a cool, sunny window position.

LEMON-VERBENA, known to herb gardeners for years as *Lippia citridora*, but now called *Aloysia triphylla* by botanists, is one of the most fragrant-leaved plants that can be grown in the garden. It is a woody shrub native to Chile and Argentina where in warm sections it grows in the open to 8 feet or more. In the cold parts of the United States, where it does not grow nearly as tall, lemon-verbena must be wintered indoors.

How To Grow It

A common way to grow lemon-verbena in the North is to keep it in a pot year-round. In summer the pot may be sunk in an appropriate spot in the garden—with other herbs or in the ornamental border. Because of its decorative qualities as well as its scented foliage, lemon-verbena deserves a featured location, as on the patio.

Before the first autumn frost, lemon-verbena should be brought indoors and cut back slightly, with the clippings dried for use in the house. Then, the plant may be placed on a sunny windowsill or in a cool greenhouse for winter enjoyment.

Another method is to give lemon-verbena a more distinct rest period by withholding water for weekly stretches in a frost-free cellar. In February repot the plant in good garden loam to which some leafmold has been added, then cut back to heavy growth. Water it frequently, including a twice-weekly spray of warm water. Lemon-verbena should leaf out by April and be ready for terrace or garden by early summer. At that time cuttings may be taken to produce new plants. Bear in mind that mature plants are preferable because the lemon fragrance is stronger with age.

Lemon-verbena has narrow, long and pointed leaves, which are in whorls of three. The white and pale lavender flowers are minute, appearing in spiky, terminal racemes in summer. The leaves may be harvested at any time, then dried for use in a potpourri with rose petals, lavender, rose geranium leaves and other fragrant blossoms and foliage.

The leaves, fresh or dried, may be brewed for a tea of a very special kind, or a few might be added to a pot of India tea for a lemony flavor. They will impart a delicately elusive flavor to puddings and cakes. Medicinally, an infusion has been recommended as a stomachic and an antispasmodic for the relief of indigestion.

In one of his books Richardson Wright suggests an imaginative use for lemon-verbena. Mix one part of dried lemon-verbena leaves with two parts of dried lavender in a small organdy "pillow-bag" and tuck it between the pillows of one's bed. Result: pleasant dreams!

A Bit of History

Lippia was named for François Josef Lipp (or Lippi), a contemporary of Linnaeaus. The plant has various common names according to where it is grown. One of them, 'Herb Louisa,' has an intriguing history, as recounted by Mary-Elizabeth Fitz-Gerald in the 1942 HERBARIST:

"When the Emperor Maximilian and the Empress Carlotta began their tragic adventure in Mexico in 1864 (he, the Archduke of Austria, had been offered that imperial throne by the French, who then controlled Mexico), they enlarged the splendid gardens of the Montezuma Palace. As it was not considered kingly to cultivate plants for utility or profit, the gardens were made to abound in fragrant herbs. Among others were the lemon-verbena, which the imperial exiles named *Yerba Louisa*, after Carlotta's mother, Princess of Orleans, wife of the Belgian king, Leopold."

The article concludes: "The term Verbena Oil is often heard, with the conclusion that *Lippia citriodora* is used in its manufacture, but the U.S.D.A. states: Inasmuch as its price is out of proportion to its value, the oil is not an article of commerce. For most purposes it can be replaced by the cheaper Lemon-grass Oil (*Andropogon schoenanthus*), which is known as East India Verbena Oil. Genuine Verbena Oil is rarely to be had." ◆

The cult promoting the use of foods produced with only organic fertilizers is still with us

WHAT ABOUT THE "ORGANIC" WAY?

By Kenneth C. Beeson

From the NEW YORK TIMES, April 16, 1972
The New York Times Co. Reprinted by permission.

NOW the adherents have introduced a whole new vocabulary—albeit without explanatory definitions—including such extravagant terms as macrobiotic foods, organic toothpaste, natural honey and organic bananas. The use of such edibles, it is claimed, would promote "buoyant health and longevity."

A visit to the local supermarket, and most assuredly the health food store, will bring forcibly to one's attention the ubiquity of items classified as organic foods. To demonstrate conclusively that such foods are superior, inferior or equal to the ordinary market variety is very difficult. Let us examine the facts as we know them.

The advocates of organically grown foods believe that food crops grown with organic fertilizers only (barnyard manures, composts, feed lot wastes, etc.) provide more healthful and nutritionally superior diets for animals and man than do those crops grown with the customary commercial fertilizers composed mainly of inorganic chemical compounds. These persons believe that such plants are more resistant to disease and insects. Hence, no chemical sprays or other protective treatments are required. The apostles of this creed, at times in the past, have been quite militant and their political strength has been felt in the halls of Congress.

Actually, few scientifically controlled experiments have been devised to compare the quality of crops grown exclusively with organic fertilizers and those grown with inorganic chemicals. One such experiment was reported several years ago from the University of California at Berkeley. Essentially, this was a comparison of food grown with organic composts with one grown in water culture using inorganic, water-soluble chemicals as the source of the plant nutrients. The mature crops were fed to guinea pigs for a period of twelve weeks.

The animals in both groups showed equal growth, excellent skeletal and muscular development, good condition of fur, and clear eyes. The conclusion drawn was that soil organic matter, or humus, had no different effect than did artificial water culture media on the grass fed the guinea pigs. However, because of certain technical difficulties in eliminating completely either organic matter or inorganic chemical compounds from the nutrient media, unequivocal conclusions based on the results of this experiment may not be justified.

Concentrations of vitamins, minerals, and proteins in food crops are influenced by several natural factors including the quantity and quality of light, air and soil temperatures, air and soil moisture, the varietal strain of the plant, and the fertility level of the soil.

Among the early investigations at the U.S. Plant, Soil and Nutrition Laboratory were those designed to evaluate some of these factors. For the first time, carefully planned and controlled experiments were devised to determine the effects of light. It was found that the quantity and intensity of sun-light falling directly on the tomato fruit had a far greater influence on the concentration of vitamin C than did any variation in the supply or character of nutrients supplied to the plant. This was true in either soil or water cultures.

It is well known that tomatoes grown during the long days of the summer taste better than do those grown under glass in the winter. Tomatoes grown in the fall or winter may have approximately one-half the vitamin C concentration than have those grown in the same nutrient media in the summer. Tomatoes grown in the same soil transported to widely different climatic regions may differ in vitamin C, but when they are grown in different soils in one location, they do not differ in their vitamin concentration. Likewise, it could not be demonstrated at the Cornell Laboratory that the source or nature of the nutrients supplied other plants, the leaf of the turnip, for example, had significant effects on concentrations of other vitamins present in the plant or plant part.

In 1938 there was organized by several scientists in southern agricultural experiment stations a united effort to study the factors affecting the nutrient composition of foods of vegetable origin. Known as the Soil-Weather Project, experiments were planned and executed to test the effects of soils, climate and management practices on the content of measurable nutrients in food crops. Emphasis was put on the turnip leaf used extensively in the South as a vegetable.

The published results may be summarized with the following correlations: 1. High radiation—high vitamin C concentration and lower than average iron concentrations; 2. High relative humidity—high carotene concentrations; 3. High soil temperatures—high concentrations of the B-vitamins and minerals; 4. High soil organic matter levels—high concentrations of carotene, thiamin and iron in the plant, but low levels of riboflavin, magnesium and sodium. No effect on vitamin C was noted; 5, High rainfall—high concentrations of vitamin C, riboflavin, thiamin, magnesium, and sodium; 6. Weather factors, including soil moisture and temperature, and the age of the plant were dominant over soil properties in determining the concentrations of most of the vitamins in the plant.

It was becoming recognized, however, that experiments to resolve the controversy of organic vs. inorganic fertilizers were extremely difficult, if not impossible, to design. To investigate the problem further an experiment using both pot cultures and field tests was conducted at the Cornell Laboratory. Carrots, snap beans and potatoes were grown in the pots. One-half of the pots received compost only, while the remainder received inorganic chemicals only. Exactly the same quantities of nitrogen, phosphorous and potassium were present in each of the fertilizers applied. The crops were planted so as to mature at about the same time. No differences were found in the concentrations of either vitamin C or carotene in the crops when harvested.

The Long Island Branch Experiment Station of Cornell University had some experimental plots that had received nothing but compost or animal manures for over 25 years. Two crops, rye and potatoes, were grown on these and on comparable plots that received only inorganic fertilizers. No differences were found in vitamin C, carotene, iron or copper concentrations in the crops from either soil.

To understand the difficulties in interpreting the experimental work cited in the above examples, we must clarify the term "nutritive value." First of all, it should not be confused with the taste or flavor of a food. Mother's bread or the apple grown in the family garden may invoke a memory that seems quite different from the bread from the local bakery or an apple picked immature to be shipped thousands of miles. But are they different nutritionally? A tomato picked when still slightly immature may have a higher vitamin C concentration than one that is fully ripe but is better tasting.

The term "nutritive value" or "nutritive quality" applied to a given food must be taken to refer to the integrated contribution of all of its nutritive components, known or unknown. It is imposszle at the present time to express these terms by a single unique value in abstraction from the conditions of the method of production of a food. Long and costly use of experimental diets with man as the subject is the only complete method for comparing nutritional values of two foods. Yet each such trial represents a unique set of conditions. By its very nature each model defies complete description. The value of the data, their interpretation, and the certainty with which they can be extended or predicted into other conditions, other models, rests solely on the completeness with which the models can be described.

The difficulties of assessing the nutritional quality of foods are also inherent in the biological system we call the soil. Plant physiologists have long recognized that organic matter in soils must be decomposed before its mineral components are utilized by the plant. The exact mechanisms of uptake of mineral elements by plants are not completely understood, but the minerals must be present in the ionic form in either the soil solution or on the soil colloidal material. The conversion of the insoluble organic compounds of the mineral elements to soluble forms is accomplished by the micro-organisms in the soil. The released elements are then exactly in the same condition as those added to the soil as inorganic fertilizers.

The value of organic matter as a source of plant nutrients and as a soil conditioner is universally recognized. But extremists would limit or even prohibit the use of inorganic chemicals for the production of food crops. To do so, however, would limit the output of foods, result in fantastically high food prices, and eventually cause widespresd malnutrition and even starvation. For there are not sufficient supplies of compost and animal manures to meet the requirements for fertilizers at our present levels of food production.

Furthermore, there is no valid evidence that crops grown solely with composts, manures, or other organic sources of plant nutrients are superior. ◆

Florida Palm Scourge

THE tropical scourge known as lethal yellowing, which is devastating coconut palms in the Florida Keys, has hop-scotched from island to island and has now reached the mainland of Florida. Already many hundreds of coconut palms have been ravaged by the disease in the Miami and Fort Lauderdale areas. In Jamaica alone, over 500,000 palms have been killed by the lethal yellowing. *(Editor's Note: See also pages 30 and 52.)*

Research on the disease has been undertaken by the Institute of Food and Agricultural Sciences, University of Florida, Gainesville, as well as the Division of Plant Industry of the Florida Department of Agriculture. The university has assigned this project to the Plantation Field Laboratory at Fort Lauderdale for intensive study.

Dr. Bryson James, director of the station, has requested several hundred coconut palms from seedling size to 12 feet in height. Because of the increase in the price of this type of palm, experimental plants have been difficult to obtain.

The Florida Nurserymen and Growers Association has promised Dr. James an adequate number of palms for the necessary research work at the laboratory, and FNGA President Joe Shaw has pledged the association's all-out assistance to Dr. John Sites, who heads the Agricultural Research System at the University of Florida, in the system's efforts to curb the spread of lethal yellowing.—*AMERICAN NURSERYMAN,* Dec. 1, 1972.

1972 BOOKS WORTH NOTING

In the Library of the Brooklyn Botanic Garden

Arrangements

Forever Flowers by Rejean Metzler. Charles Scribner's Sons, New York. $9.95

How to preserve flowers and foliage with glycerine and other materials. Decorative recipes and wiring methods.

The Flower Lovers' Book of Natural Arrangements by Georgiana Reynolds Smith. Doubleday & Company, New York. $7.95

Elements of design, with much practical advice for the beginner.

Books in Series

Ferns and Palms for Interior Decoration by Jack Kramer. Charles Scribner's Sons, New York. $6.95 clothbound, $3.95 paperback.

Also published by Mr. Kramer in the Scribner's series in 1972, with the same prices: *Garden Planning for the Small Property; The Natural Way to Pest-free Gardening; Your City Garden.* All are well illustrated.

Gardening

Hanging Plants for Home, Terrace and Garden by John Philip Baumgardt. Simon & Schuster, Inc., New York. $7.95

Brief descriptions and cultural advice for a wide variety of trailing plants, based on a midwestern garden editor's experience with them. Information on window boxes, hanging baskets and other containers for indoor and outdoor gardens.

Nature's Guide to Successful Gardening and Landscaping by William Flemer, III. Thomas Y. Crowell Company, New York. $8.95

Plant trees and shrubs according to their environmental requirements. The author, a prominent wholesale nurseryman, discusses woodland, city, seashore and other kinds of gardens.

128 Houseplants You Can Grow by Bob Herwig. Collier Books, New York. $1.50

A 60-page paperback on common house plants, with a code to their care. Although species names are not always given, the color photographs, of which there are 100, are clear and tell much of the story.

The Illustrated Guide to Personal Gardening by Josephine von Miklos. Prentice-Hall, Inc., Englewood, N.J. $9.95

Some favorite plants and thoughts on their use. The title is misleading, but the author writes with warmth and perspective.

History

The Compleat Naturalist: A Life of Linnaeus by Wilfrid Blunt. The Viking Press, New York. $14.95

The best general biography of the Swedish botanist to appear in recent years.

Plants in the Service of Man by Edward Hyams. J. B. Lippincott Co., Philadelphia. $6.95

Interesting facts and conjecture on the early history of fruits and vegetables, by a prolific English novelist and garden writer.

Linnaeus and the Linnaeans by Frans A. Stafleu. Distributed by Stechert Hafner Service Agency, New York. $17.50

A tightly researched account by a Dutch scholar, primarily for students of taxonomy, on botany's best known classifier and the spread of his ideas in the 18th century.

E. I. DuPont, Botaniste by Norman B. Wilkinson. University Press of Virginia, Charlottesville. Clothbound $7.50, paperback $3.95.

Splendid depiction of the DuPont family's involvement with horticulture over the years.

Landscaping

Landscape Your Florida Home by Mae Perry. E. A. Seaman Publishing, Inc., Miami, Florida. $9.95

Including a section on mobile homes.

Small Gardens are More Fun by Rhoda Specht Tarantino. Simon & Schuster, Inc., New York. $8.95

An imaginative selection of photographs and designs of 101 small gardens, as well as descriptions of them. Woodland, herb, container, vegetable and other gardens. There is special emphasis on garden structures and low maintenance.

Miscellaneous

Feasting Free on Wild Edibles by Bradford Angier. Stackpole Books, Harrisburg, Pa. Clothbound $7.95, paperback $4.95.

Like Euell Gibbons, the author makes it all sound very enticing and easy.

Flowers of the World by Frances Perry, illustrated by Leslie Greenwood. Crown Publishers, New York. $22.50

A big, handsome volume from England with wide-ranging text and exquisite color illustrations. George Kalmbacher of the Botanic Garden staff served as American consultant.

A Gardener's Guide to Plant Names by B. J. Healey. Charles Scribner's Sons, New York. $7.95

A balanced, readable account, in dictionary form, of the meaning and history of various botanical names. It will remind many readers of A. W. Smith's book (1963) of similar title but broader scope.

The Common Insects of North America by Lester A. Swan and Charles S. Papp. Harper & Row, New York. $15.00

A very useful and thorough guide to identification, with many illustrations.

The Natural World

Island Year by Hazel Heckman. University of Washington Press, Seattle. $7.95

A very human account, in monthly diary form, of the animal and plant life on an island in Puget Sound that is threatened by developers, smog and other contemporary maladies.

The Complete Ecology Fact Book, edited by Philip Nobile and John Deedy. Doubleday and Company, New York. $10.00

Not exactly complete, but it does contain a wealth of useful information.

Reading the Landscape of Europe by May Theilgaard Watts. Harper & Row, Publishers, New York. $8.95

The Continent through the eyes of a keen naturalist and student of history. An engaging account for the traveler who wants to see more than the capital cities.

Plant Groups

Forests of Lilliput: The Realm of Mosses and Lichens by John Bland, Prentice-Hall, Inc., Englewood Cliffs, N.J. $7.95

The fascinating story of some of nature's least understood plants.

The Strange and Beautiful World of Orchids by Friedrich Ebel and Otfried Birnbaum. Van Nostrand Reinhold Co., New York. $20.00

A handsome volume of full-page color photographs and brief text.

Home Garden Book of Roses by the staff of Natural Gardening Magazine. Charles Scribner's Sons, New York. $10.00

Attractively done, with basic growing information and lists of recommended varieties.

A History of the Orchid by Merle A. Reinikka. University of Miami Press, Coral Gables, Florida. $15.00

Advanced amateur growers will especially enjoy this carefully researched study of a noble plant family and old-time explorers.

Orchid Care by Walter Richter. The Macmillan Company, New York. $7.95. Translation of a German work (1969).

For the real enthusiast. Copious line drawings by Hans Preusse.

Growing Unusual Fruit by Alan E. Simmons. Walker and Company, New York. $10.00

From akebia to "zabala" fruits, by an English horticulturist.

Willows by S. C. Warren-Wren. David & Charles Publishers, Newton Abbot, England. £2.50

A welcome account for lowland gardeners, although a number of desirable species mentioned by the author are unavailable in the American nursery trade.

Textbooks

Turfgrass Science and Culture by James B. Beard. Prentice-Hall, Inc. Englewood Cliffs, N.J. $17.95

Lighting for Plant Growth by Elwood Bickford and Stuart Dunn. Kent State University Press, Kent, Ohio. $16.00

A wealth of technical information for the professional grower.

Horticultural Science, second edition, by Jules Janick. W. H. Freeman and Company, San Francisco. $12.00

Fundamentals of Plant Pathology by Daniel A. Roberts and Carl W. Boothroyd. W. H. Freeman and Company, San Francisco. $15.00

Plant Growth Substances in Agriculture by Robert J. Weaver. W. H. Freeman and Company, San Francisco. $19.50

For Younger Readers

Wild Green Things in the City by Anne Ophelia Dowden. Thomas Y. Crowell Co., New York. $5.95

Let's hope that youngsters share this book with their parents, for apart from the clear, brief text, it contains a number of superb color illustrations of weeds. A gem by one of America's finest botanical artists.

A Tree Grows Up by J. M. Guilcher and R. H. Noailles. Sterling Publishing Co., New York. $3.69

Fine close-up photographs of tree parts.

Terrariums by John Hoke. Franklin Watts, Inc., New York. $3.95

"Ecology" in the Wardian case. A how-to guide, well illustrated and with a list of suppliers of materials for the terrarium.

Learning about Nature through Indoor Gardening by Virginia Musselman. Stackpole Books, Harrisburg, Pa. $3.95

About 74 common house plants and their care. New plants from kitchen throwaways.

Kids Gardening by Aileen Paul. Doubleday & Co., New York. $4.50

Ideas for indoor gardens.

Seeing What Plants Do by Joan Elma Rahn. Atheneum Publishers, New York. $4.95

Experiments that can be done at home.

Paperback Reprints

From Dover Publications, Inc., 11 E. 2nd St., Mineola, N.Y. 11501

Growing Woodland Plants by Clarence and Eleanor G. Birdseye. $2.50

Northeastern Trees in Winter by Albert Francis Blakeslee and Chester Deacon Jarvis. $3.00

Handbook of the Trees of New England by Lorin L. Dame and Henry Brooks. $3.00

A Modern Herbal by M. Grieve. Two volumes, $5.00 each

Sturtevant's Edible Plants of the World, edited by U. P. Hedrick. $5.00

Identify Trees and Shrubs by Their Leaves by Edward Knobel. $1.25

From William Morrow and Co., 105 Madison Ave., New York 10016

How to Prune Almost Everything by John Philip Baumgardt. $2.45

Greenhouse Gardening for Fun by Claire L. Blake. $2.45

A Book about Soils for the Home Gardener by H. Stuart Ortloff and Henry B. Raymore. $2.45

African Violets by Helen Van Pelt Wilson. $2.95

The Joy of Geraniums by Helen Van Pelt Wilson. $3.25

Drawing by Laurie Olin from ISLAND YEAR by Hazel Heckman

INDEX TO VOLUME 28 (1972)

Spring: Herbs and Their Ornamental Uses
Summer: The Home Vegetable Garden
Autumn: A House Plant Primer

Symbols: Sp (Spring, No. 1); Su (Summer, No. 2); A (Autumn, No. 3); W (Winter, No. 4)

African-violets, A 20
All-America Selections, vegetables, Su 18
Alpine house, W 35
Asparagus, Su 60
Avery, George S., Sp 40
Avocado, A 22
Baer, Mary E., Sp 45
Balgooyen, Warren, W 27
Banadyga, Albert A., Su 29
Barnes, Elsetta Gilchrist, Sp 7
Basil, 'Dark Opal' Sp 39
Batchelder, Helen Tilton, Sp 83
Beans, Su 53
  bush and pole, Su 53
  butter, W 42
  runner, Su 70
  varieties, Su 18
Beeson, Kenneth C., W 58
Beets, Su 56
  varieties, Su 18
Birds, shifts in population, W 27
Books
  of 1972, W 61
  on alpines, W 38
  on house plants, A 62
Bowman, Frank, A 44
Boxwood, Sp 41
Breeding, plant, haploid techniques, W 9
Brigham, Dorcas, Sp 70
Broccoli, Su 71
  varieties, Su 19
Bromeliads, culture, A 46
Brooklyn Botanic Garden
  children's vegetable garden, Su 89
  fragrance garden, Sp 75
Brooks, William M., Su 56
Brown, Elizabeth Foster, Sp 22
Brussels sprouts, Su 71
  varieties, Su 19
Bryan, John E., Sp 73
Buhle, Louis, photographs by, W 31
Cabbage, Su 71
  varieties, Su 19
Cactus, Christmas, A 44
Campbell, Mary Mason, Sp 79
Carrots, Su 57
  varieties, Su 19
Cathey, Henry M., W 4
Cauliflower, Su 71
  varieties, Su 19
Celeriac, Su 68
Celtuce, Su 69
Chicago Horticultural Society, new herb garden, Sp 22
Chives, Su 81
Connors, Mary Jane, A 63
Corn, see Sweet corn
Corn salad, Su 35
Crawford, Hester Mettler, 4, 84
Cress
  upland, Su 32
  water, Su 65
Cucumber, Su 75
  varieties, Su 20
Currid, Bernard, Sp Sp 57
Deciantis, Josephine, Sp 49
Dietz, Marjorie J., Sp 1, Su 1, 41, A 1, 52, W 1
Drury, Daphne S., A 9
Eggplant, Su 43
  varieties, Su 20
Equipment and tools, Su 23
  power, Su 25
Erichsen-Brown; Charlotte, Sp 61
Exotica 3, A inside cover 3
Farwell, Edith Foster, Sp 22
Ferguson, Barry, A 31
Ferns
  indoors, W 16
  sources for, W 14
Fischer, Robert B., Sp 13
Fletcher, Robert F., Su 5
Fordham, Alfred J., W 49
Foster, F. Gordon, W 16
Fox, Helen M., Sp 68
Free, Montague, A 4
Gambee, Eleanor Brown, Sp 76
Gardenia, A 24
Garlic, Su 81
Giasi, Marie, A inside cover 3
Ginns, Anne Birdsey, A 58
Girasole, Su 67
Grasses, ornamental, W 46
Greens, Su 31
  collard, W 42
  turnip, W 43
Gypsy moth, control, W 29
Hafen, Leslie, Su 53
Hall, Elizabeth C., A 62
Hammond, Elsie T., A 50
Hastings, W. Ray, Su 18
Havis, John R., W 7
Herbs, Sp
  as house plants, A 13
  as ornamentals, Sp 10
  beauty of, Sp 5
  books on, Sp 84
  combinations of, Sp 61
  for dried bouquets, Sp 45
  for edging, Sp 8
  for winter garden, Sp 81
  from Greece, Sp 26
  in California, Sp 24
  in Chicago Horticultural Society Garden, Sp 22
  in children's garden, Sp 21
  in city, Sp 16, 18
  in Cleveland community garden, Sp 35
  in containers, Sp 79
  in England, Sp 31, 33
  in New Zealand, Sp 29
  in vegetable garden, Sp 51
  knot gardens for, Sp 57
  planning garden of, Sp 7
  uses indoors, Sp 49
Himes, Lois Beckett, A 15
Hockenberry, Mary W 46
Hodyss, Loretta Wohlt, A 24
Hoffman, Donna, Su 53
Hofmann, Thomas R., A 27
Hominy, W 43
Hooper, Madge, Sp 33
Horticulturists, role in environment, W 4
House Plants, A
  as decorations, A 31
    in unused fireplace, W 22
  basic care, A 54
  books on, A 62
  for north windows, A 10
  from seed, W 20
  herbs as, indoors, A 13
  in Alaska, W 24
  mail-order sources for, A 63
  pest control, A 58
  problems, A 9
  questions and answers on, A 17
  vacation care, A 61
  watering, A 15
  winter garden indoors, A 4
Huttleston, Donald G., W 14
Huntley, Elsa, A 13
Ivy, English, A 27
Jerusalem-artichoke, Su 67
Jezik, Laura, W 35
Johnson, W. B., Su 60
Johnston, Sallie C., W 22
Kale, Su 35
Kalmbacher, George, A 46, W 23
Kissack, Lucile Teeter, Sp 7
Kitton, M. E., W 39
Kohlrabi, Su 66, 71
Lavender, Sp 76
Lee, Mary-Elizabeth, W 24
Leek, Su 81
Lemon-verbena, W 56
Lent, Joseph M., Sp 39, Su 21, 28, 44, 50
Lettuce, Su 31
  varieties, Su 20
Link, Conrad B., A 40
Lipp, Lewis F., Sp 34
Lord, Priscilla Lord, Sp 5
Maclura pomifera, W 45
Maynard, Donald N., Su 9
McDaniel, Joseph C., W 45
McGourty, Jr., Frederick, Sp 1, Su 1, A 1, 63, W 1
McKenzie, Elizabeth, Sp 31
Medlar, Sp 34
Melons, Su 75
Mespilus germanica, Sp 34
Metcalf, H. N., Su 64
Miner, Frances M., Su 89, A 20
Minges, P. A., Su 71
Moulin, Edmond, A 17
Muenscher, Minnie Sp 51
Mustard, white, Su 32
Mycoplasmas, W 52
Niebuhr, Alta Dodds, Sp 26
Nitsch, Jean-Paul, W 9
Oebker, Norman F., Su 12
Okra, Su 52, W 43
Onion, Su 79
Orchids, for windowsill, A 42
Organic gardening, W 58
Osage-orange, W 45
Palm, lethal yellowing disease, W 30, 60
Palmer, Edward L., Su 23
Pampas grass, W 47
Parakeet, monk, W 27

Parsley, Su 32
Parsnips, Su 57
Patch, Katharine Treat, Sp 35
Paterson, Allen, Sp 10
Paving, informal, W 39
Peas, Su 53
  southern, W 44
  varieties, Su 20
Pepper, Su 44
  varieties, Su 20
Peters, Ruth Marie, W 20
Pilea 'Moon Valley,' W 23
Pineapple, growing a, A 49
Poinsettia, A 40
Pollack, B. L., Su 36
Potatoes
  lazy man's patch of, Su 42
  sweet, W 44
Price, Francis Ellis, Sp 1
Propagation, frame for softwood, W 49
Pumpkin, Su 76
Radishes, Su 59
  varieties, Su 20
Rhubarb, Su 62
Rock garden, herbs in, Sp 70
Rodriguez, Mollie Harker, A 10
Rollins, Elizabeth D., Sp 24
Roquette, Su 32
Roses, old, Sp 54
Salsify, Su 57
Sanok, William, Su 79
Savos, Milton S., Su 82
Schroeder, D. B., Su 86
Seed, pelleted or coated, Su 44
Shallot, Su 81
Shopis, Nancy, Sp 75, A 22
Shrubs, root hardiness of container-grown, W 7
Shurtleff, Malcolm C., W 52
Simpson, Clare M., Sp 29
Soybeans, Su 55
Spinach, Su 35
  New Zealand, Su 34
Squash, Su 75
  cushaw, W 43
  varieties, Su 20
Strybing Arboretum, garden of fragrance in, Sp 73
Sweet corn, Su 29
  varieties, Su 19
Swiss chard, Su 35
Taylor, J. Lee, Su 31
Terrariums, A 50
  new containers for, A 52
Thomas, Graham, Sp 54
Thomson, Cecil L., Su 75
Thyme, Sp 76
Tomato
  culture, Su 36
  husk, Su 64
  varieties, Su 20
Tomson, Robert S., A 61
Tools and equipment, in vegetable garden, Su 23
Trees
  root hardiness of container-grown, W 7
  x-ray diagnosis, W 8
Trueblood, Emily E., Sp 18
Turnips, Su 58
Turnquist, Orrin, Su 45
Van Brunt, Elizabeth Remsen, Sp 81, W 56
Vegetable garden, Su
  children's, at Brooklyn Botanic Garden, Su 89
  disease control in, Su 86
  fertilizers for, Su 10
  location of, Su 5
  plans for, Su 7, 48, 94
  planting the, Su 12
  soil in, Su 9
  summer care, Su 45
  tools and equipment, Su 23
  varieties for Su 18
Vegetables, Su
  diseases of, Su 86
  in garden at Mt. Vernon, Sp 13
  insects of, Su 82
  mini-kinds, Su 21
  ornamental, Su 50
  planting chart of, Su 13
  salad, Su 31
  southern-style, W 42
  storage of, Su 28
  unusual, Su 64
  varieties of, Su 18
Watercress, Su 65
Weisman, Brenda, A 42, 60
Western Reserve Herb Garden, Sp 35
Wild flowers, for terrarium, A 53
Wilson, Jim, W 42
Zucker, Isabel, Su 4
Zverina, Frances, Sp 20

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